Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

The Story of Roads Told In Murals in Highway Office

The romance of road construction and the enormous strides made in recent years in the development of safe, serviceable and attractive highways in the State of Illinois are depicted in a series of photomurals in the new Peoria office of Theodore Plack, District Engineer of the Illinois Division of Highways.

These murals, ranging from 6 to 14 feet in length and 4 feet 8 inches high, made by Kaufman & Fabry Co. of Chicago under the supervision of Ralph C. Harris, Highway Architect, show interesting problems in grade and bridge construction, roads in the making, road-building equipment, and completed highways and bridges. Attractively bordered in metal, these photographic murals harmonize with the modern appointments of the office.

The decorative effect of these murals, one of which is reproduced on page 40, is striking evidence that there is beauty and aesthetic as well as practical value in the work of our highway engineers and road builders.

Color on the Road

From Black Earth, Wis., comes a United Press dispatch announcing that a modern paver laying 1,700 feet of concrete daily near there was operated by a Negro preacher from Madison and manned by Redskins from northern Wisconsin.

Another WPA Story

We can't resist passing along another WPA story, in spite of our resolution to the contrary. This one came to us via the *Portland Press Herald* and *The Nerba*, and concerns the $1,000,000 dam which the WPA has been building out near Kansas City, Kansas. The structure,

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The Atchafalaya Floodway

Modified Jadwin Program Carried on in Louisiana

(Photos on page 40)

First Article in Series Describing U.S.E.D. Work, Equipment and Methods In Unusual Conditions

AFTER the 1927 flood, when the Jadwin Plan for Mississippi Flood Control was enacted, an enormous program of raising and strengthening levees was begun. The levees provided for contained approximately one and a half times as much earth as formerly, although only slightly higher. On the main river this program has included placing somewhat more than half a billion cubic yards to date and is substantially completed. The new plan also provided for removing about half of the water of a great flood from the river through a system of floodways or diversions.

The diversion program, among other things, provided for the construction of over 200 miles of levee in the Atchafalaya Basin, of which about 80 per cent is completed, approximately 90,000,000 cubic yards having been placed to date.

This huge construction program under way in the Atchafalaya Basin paralleling the Mississippi River from Simmesport to Morgan City, La., a distance of approximately 100 miles in an air line, is little appreciated by engineers and contractors either as to its extent, the importance of the program, the methods being used to create levees under conditions hitherto thought impossible to overcome, and the very nature of the terrain itself.

The average educated citizen of the United States knows less about this area than he does about darkest Africa which has been so well illuminated on the silver screen through travelogues and news reels. The motorists' map shows one main highway traversing this area from east to west, U. S. 71-190, and a pair of rivers, the Atchafalaya and the Grand, and a lake or two, but beyond that there is no suggestion of the character of the area.

There are hundreds of miles of navigable waterways all the way from borrow pits created by levee construction, to bayous, passes, and small streams and lakes that are plied daily by hundreds of small power boats, a few Army air boats, dredges and tow boats, and on these waterways live hundreds of self-supporting Americans whose homes are built on small barges or scows, whose cow barns and hen houses occupy other barges and who make their living by trapping and collecting hanging moss, and growing a few vegetables on wonderfully fertile small patches of humus. Army engineers report these folk as the least difficult to deal with in times of flood because they are prepared, their houses and barns rise with the flood waters which are only 5 or 6 feet, and when the waters subside, work starts again.

This area has, however, a most important function in the protection of the more highly developed agricultural and industrial areas closer to the Mississippi River. This was mentioned emphatically in the original Jadwin Report in December, 1927. The new plan sets forth definitely that there shall be a controlled intake on the Mississippi River north of

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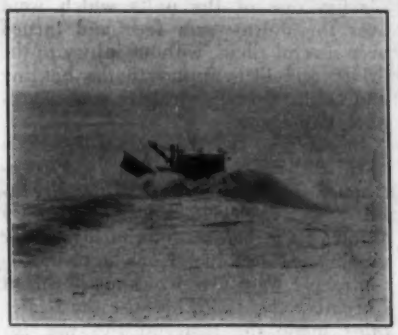
Surveying in the Atchafalaya Basin in Louisiana



Tackling a Sea of Snow in North Dakota with an International 15-Ton Truck Pushing a Bros V-Type Plow with an American Wing

Fighting Snow In North Dakota

Inadequate Funds and Type Of Roads Make Snow Removal Problem Unusually Difficult

By S. M. BROWN, Former Maintenance Engineer,* North Dakota Department of State Highways

(Photo on page 40)

THE problem of preventing snow-blocked highways in North Dakota is a tough one, due to a large percentage of low-type highways, inadequate funds and equipment. The highway system comprises 6,700 miles of State and Federal highways and it is beyond the ability of the State Highway Department to maintain it satisfactorily.

We do not follow the policy of plowing during a storm because of poor visibility and lack of necessary funds. If we had the equipment and finances, we should plow during storms when possible rather than allow the snow to pile in drifts on the road. However, our operators find it impossible to see in many of the blizzards which occur here. North Dakota is a prairie state with very few trees and other natural obstacles to drifting, with the result that our worst storms are blinding in intensity.

Another problem is that we have many miles of low-type road with a small V-type ditch which furnishes a very small reservoir for snow. After the first intensive storm, the ditches are full and the V-type push plows pile the snow on each side in high drifts. Rotaries are needed completely to clear this type of highway but as we have only seven such units it is impossible to keep much more than the U. S. routes open at all times. Because of lack of equipment, our secondary routes

*This article was prepared by S. M. Brown just prior to his leaving his position of Maintenance Engineer for the North Dakota Department of State Highways.

(Continued on page 13)

A 1½-Million-Yard Dam For New Water Supply

Little Rock, Ark., Job At Alum Fork Completed By L. O. Brayton & Co., 40 Miles West of City

(Photos on page 40)

FAST dirt moving with well-maintained equipment marked the Alum Fork Dam contract completed by L. O. Brayton & Co., of Dyersburg, Tenn., well within the twelve months allowed in the contract. At the site of the work, 40 miles west of Little Rock, with only a Forest Service Road for hauling in equipment and supplies, the contractor set up a complete camp, even to a pair of old double-truck street railway cars for bunk houses, one of which displayed the well-known Pullman sign "Quiet Please."

When the contract was signed the contractor agreed to start moving dirt not later than October 1, and in spite of the proximity of the date a Northwest dragline with a 2¼-yard Northwest bucket was moved in over the tortuous road and, at 11:45 A.M., October 1, 1936, started excavating the drainage ditch in the upstream borrow pit.

The 1,500,000-cubic yard dam will impound 14,000,000,000 gallons of water in an area of 1,290 acres, with a shoreline of 12 miles. The dam is 2,400 feet long, exclusive of the spillway, 115 feet maximum height, 600 feet wide at the base and 20 feet wide at the top. The elevation of the top of the dam is 755 feet, and of the spillway 740 feet. The spillway has a length of 300 feet and is capable of discharging 225,000 gallons per second. The site of the dam is ideal as far as design is concerned, with an excellent location for the spillway without the need for heavy excavation for the channel. The material available was examined by a great many soil experts who visited the work and found it of unusually high grade throughout.

The upstream and downstream slopes of the dam are broken by two berms each 10 feet wide. On the downstream side the bottom slope is 2½ on 1 for one-third the height, then between the two berms 2 on 1, and the top third 1.8 on 1. The upstream slopes are respectively 2¾ on 1, 2¾ on 1, and 2 on 1. Both faces of the dam were finished with an Ateco bottomless scraper pulled by an Allis-Chalmers Model L tractor, leaving a true smooth face for sodding on the downstream face and riprap on the upstream. The 6 x 6 x 12-inch riprap with hand-driven spalls was dumped 1 foot thick on the upstream face up to the second berm and above that was hand-placed with 6 inches of gravel beneath it. A portion of the dumped riprap was stone hand-grubbed from the material not permitted in the dam itself. The hand-placed riprap was done by subcontract.

The downstream face and the crown of the dam were covered with 6 inches of top soil and sodded with sprigs of Bermuda grass on 1-foot centers. Sprinkling water was supplied by a 6-inch Jaeger Sure-Prime centrifugal pump from a pool formed by damming the water of Alum Fork below the conduit. Adjacent to the pump a diving board was set up and the engineers indulged in the use of "the old swimming hole" when off duty. The water was carried over the face of the dam by a 4-inch header pipe with 1-inch connections for the hand sprinkling hose.

Stripping, Cut-Off Excavation

The stripping of the dam site and the excavation of the temporary diversion conduit through the dam was done with a Northwest dragline and a 2¼-yard Page bucket loading to Euclid Trac-Truks. The top soil was stockpiled for use on the face of the dam. Some of the remaining excavated material was wasted and the balance went into the dam base.

The cut-off trench, which was excavated to rock, was 30 feet wide at the bottom and varied from 12 to 15 feet in depth. It was backfilled with impervious material. In addition a width of about 250 feet for the center impervious core was stripped to rock while the outside pervious sections were stripped to a depth of 1 foot for the removal of all roots, top soil and vegetation. The material for the center impervious core was largely clay. Outside of Stations 10 and 25 it was considered unnecessary to carry the excavation through to rock so from those points to the ends of the dam the excavation was carried only to a depth of 1 foot.

Excavating, Hauling Equipment

The contractor used thirteen 7 and 8-yard Euclid Trac-Truks for hauling the embankment material, supplemented by an Allis-Chalmers 7-yard Speed Ace, and two Koehring 7-yard crawler wagons. This fleet was loaded with two Northwest draglines with 2-yard Page buckets and a Lorain 1¼-yard shovel. The assignments were usually four of the hauling units to each loading unit with the balance maintained as spares as needed. Such instances included replacing one of the units which went over the downstream face and turned over several times, without injury to the driver and little injury to the hauling unit although the trailer was somewhat damaged.

In starting the dam embankment a so-called upstream coffer was constructed first. This was the cut-off backfilled with selected material slightly ahead of the balance of the fill. After starting on October 1, as agreed, the contractor was forced to shut down on November 29, 1936, because the winter rains made the material too wet for satisfactory placing. Work was resumed February 8, 1937 and cleaned

(Continued on page 14)

Setting a Top Chord with the Guy Derrick

Bridge Erected By Guy Derrick

General Construction Co. Employed Unusual Method On 322-Foot Steel Bridge On Nisqually Cut-Off, Wash.

By HENRY W. YOUNG

THE Nisqually cut-off on the state highway between Olympia and Tacoma, Wash., is almost a straight tangent, by-passing a crooked section of the old highway and thereby saving not only 2.74 miles in distance but reducing the total curvature from 1,060 degrees to only 48 degrees. Every effort was made to open this road by Labor Day, the final work to be done being the completion of the Nisqually steel bridge and two concrete viaduct approaches, one 80 feet and one 90 feet long, which were part of the contract, together with a small amount of revetment on both sides.

Considering its size, a somewhat unusual procedure in erecting the bridge was followed by the General Construction Co., of Seattle, in that it was accomplished by means of a guy derrick. This is a steel bridge with a single span of 322 feet. Silicon steel floor beams were used, 47 feet long, 4 feet in depth and weighing 6 tons each. The total weight of the steel in the structure is 566 tons.

Abutment Construction

Excavation was first done inside a cofferdam at each abutment. Each of these 168 55-foot piles was driven to a depth such that the tops were sufficiently above the bottom of the excavation that 10 feet of concrete could be poured around them and over the whole bottom

(Continued on page 26)

Warren County Saves With Diesel Outfit

Former Road Districts Replaced by Divisions; County Engineer Frick Reports Changes in Mo.

THE shift from the old horse-drawn 8-foot grader that cost $16 a day to run to the heavy-duty 10-foot blade pulled by a diesel tractor costing $10 a day to operate is the key to more miles of better graded roads, according to Benjamin F. Frick, County Engineer of Warren County, Missouri. Yet the rural districts kick at the cost of the new power equipment that is really saving them tax money.

Warren County owned a Caterpillar gas Sixty and a 10-foot grader that cost $1.37 per hour to operate, including fuel, lubrication and service, but exclusive of operator, interest and depreciation. The outfit was turned in and an RD6 with a wide crawler tread and a 10-foot Caterpillar grader were purchased. This new outfit costs 33 cents an hour to run. The County also owns a Caterpillar Fifteen and an 8-foot Adams grader which are loaded onto a truck and quickly hauled to any part of the county where there is any ditch work to be done. Thus the moving, or lost, time is cut to a minimum, making the per diem cost much lower for the work accomplished.

Old Road Districts Out

The old Road Districts with their Road Supervisors were eliminated in Warren County almost three years ago. There were twenty-two districts with their supervisors, equipment and individual troubles, and now with the reorganization that has been effected there are five divisions, each with its Supervisor reporting direct to the County Engineer. Each division is equipped with a Ford dump truck having a Wood hydraulic hoist. These five divisions account for the 635 miles of roads in the county, about 25 per cent of which are of gravel or dirt well graded.

In 1936, the county built 21 miles of gravel road with WPA labor close to towns where the labor was easily moved to the work from the employment offices. There were two projects, however, where the haul for the labor amounted to a round trip of nearly 50 miles each day. As this was over paved and graveled state roads the time lost was reduced to a minimum.

In 1937, 12 miles of road have been constructed, ready for gravel, with WPA labor and all rights-of-way have been cleared and widened and the necessary culverts installed. It is the ideal of Warren County to do a complete job even though it may not be a long one rather than string out many miles of half-completed roads. "It pays in the long run," said County Engineer Frick, "for you don't have the kicks coming in with such violence."

Bridges

During the last few years a number of shorter steel and concrete bridges have been built. The longer structures in the county have steel spans and wood floors. When smaller bridges and culverts are built they are completed to State Highway Department plans and specifications.

Recently a 220-foot span bridge was erected with a 14-foot roadway. As the bridge was much needed and the county did not have the funds for a new structure a second-hand bridge was purchased from another county. A contract was awarded to the Missouri Bridge & Iron Co. to take down and re-erect the structure. Interested farmers donated the labor required to clean and paint every member of the bridge, and also to construct the large earth fills and approaches. Creosoted timber piles with reinforced concrete caps were used for abutments. The approach fills were built on a slope of 1 to 1½ and protected with heavy stone revetment.

C. & E. M. Photo

Fast Loading of One of the Thirteen Euclids by a Big Northwest Dragline

8 DIFFERENT CONTRACTORS . . .

1 BRAND OF ASPHALT . . .

Machine-spreading a TEXACO Asphalt pavement in Denver, Colo.

TEXACO Asphalt Macadam under construction in Lower Merion Township, Pa.

TEXACO on U. S. Route No. 10, between Richmond and Williamsburg, Va.

A street in Coffeyville, Kan., being TEXACO-paved.

Here is a typical group of the 1937 crop of Asphalt street and highway projects.

They are widely distributed jobs, hundreds and in some cases thousands of miles apart.

Each one is the work of a different contractor.

But on all eight jobs, the contractors were in complete agreement on one point, the choice of TEXACO Asphalt. Such countrywide popularity among contractors does not grow overnight. The Texas Company has spent 33 years building the confidence of contractors in TEXACO Asphalt products and the service behind them.

Resurfacing worn concrete with TEXACO near Huntington, N. Y.

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Constructing low-cost TEXACO Asphalt street in Louisville, Ky.

TEXACO Sheet Asphalt pavement being laid in Hartford, Conn.

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Winter Road-Maintenance Problems

There are several very important factors which must be considered in the winter maintenance of roads, in addition to the obvious economic necessity of plowing snow from road surfaces to facilitate traffic.

The first consideration in winter maintenance is drainage. If all ditches are opened in the fall there is assurance that melting snow will flow away from the road and not pool on both sides of the traveled way, creating a serious problem by weakening the foundation. All culverts and underdrains to the ditches should be opened to insure the free flow of water from the subgrade.

The proper combating of snow which has fallen on the roadway is a complex problem which requires the careful consideration of state, county and township highway officials. With the equipment available today there is practically no reason why roads should not be kept open in winter at comparatively nominal expense and with great efficiency.

Snow removal divides itself into three well-defined classifications: light snows; heavy snows and drifts; and ice. A light snow, unless drifted, is not apt to interfere seriously with traffic. Traffic passing over it, however, will quickly compact it into a solid mass approaching the consistency of ice. Although a light snow is easily handled in the early stages, it becomes increasingly difficult to dispose of and increasingly hazardous to traffic as it becomes compacted. Light truck plows or self-propelled motor graders are particularly adaptable to the removal of light snow.

Thorough removal of a light snow is essential for traffic safety. Clean plowing permits the first thaw to melt all the snow and ice on the road and to carry it off into the ditches. When too much snow is left on the road, the water does not readily flow to the ditches and a slight freeze produces a smooth ice on the surface.

Where deep heavy snows are encountered, heavy-duty plows mounted on state, county or township-owned tractors or heavy-duty trucks are the most economical way to keep the roads open. It is decidedly advantageous to have plows of sufficient size mounted on units of ample power to break open a lane in one passage wide enough for a school bus to pass through. Usually some type of V or blade plow is first used to push the snow off the road and onto the shoulder, where it is out of the way of traffic. This is usually done while the snowstorm is still in progress. Later, the same plow can be used to push the snow farther back onto the shoulders and widen the traffic lanes.

Accumulations of plowed snow resulting from a series of storms and which gradually encroach on the traveled way may be easily removed by rotary snow plows. These units are also used effectively for the removal of deep snows in sparsely populated sections and on mountainous roads where unusually deep drifts occur.

Thick layers of ice or hard-packed snow on a road usually are the result of failure to remove all of the snow, although occasionally a storm will occur which alternates between sleet and a heavy snow which will pack so quickly that, if followed by a falling temperature, it will create a hard thick layer of ice. There are two methods of handling ice. One is by making the surface nonskid by scattering sand, cinders, rock-chips or stones and the other is by the complete removal of ice. The use of an abrasive material alone will not prevent the building up of ice layers, but when calcium chloride is mixed with the abrasive material it helps to perforate the layer of ice and greatly facilitates its removal.

Early ice removal greatly reduces the amount of work to be done in the spring clean-up. If ice is not removed, it is apt to accumulate, clog ditches and prevent proper springtime drainage. One of the most effective methods of removing ice is a heavy patrol grader equipped with a scarifier and its standard blade. The scarifier can shatter the ice down to the actual road level and, after several rounds when a path is broken wide enough for blade action, the patrol grader blade can be used to push the broken ice off the road and out of the way of traffic. A road disc, properly weighted and hitched behind a motor grader or pulled by a tractor or truck, will accomplish a similar service if the ice is not too hard.

Allowing snow to accumulate on a road and not making any attempt to remove it creates a real hazard in the spring as automobiles and trucks with chains gradually wear a pair of ruts through the ice, concentrating all of the traffic in one line. When the spring comes these two ruts act as drainage channels and the road-bed is further weakened by absorbing water at the points where traffic is concentrated, resulting in severe damage.

Keep your roads clear of snow for the full traveled width to protect the investment in your highways as well as to safeguard traffic.

Will Your Roads Look Like This?

Or Like This?

Scientific Road Planning A Most Important Trend

In discussing the subject of highway design at the recent annual meeting of the Canadian Good Roads Association, J. O. Martineau, Assistant Chief Engineer of the Quebec Department of Roads, pointed out that the most important trend of the present day is the scientific planning of highways and highway systems. The time is past, Mr. Martineau said, when providing good alignments, curves, grades and all-weather riding surfaces for the benefit of the motorists was the chief purpose of a road organization, and when it could still be considered good practice to adopt uniform standards of design for long mileages without consideration of actual and future traffic requirements.

Today, because of the ever-increasing use of highways as a medium of transportation, over long as well as short distances for passengers and all kinds of goods, it has become imperative, for the economic and social welfare of the public, that cost and time out of service for construction be reduced, and that comfort and safety be increased. For this reason, it is Mr. Martineau's opinion that traffic engineering should occupy a most important place in all highway organizations so that roads may be designed to satisfy both present and near future traffic needs.

Furthermore, to safeguard the large sums of money now being invested in improvements, highways must be so constructed that traffic development will not render them obsolete at the quarter or halfway mark of their economic life.

New A.S.T.M. Specification For Concrete Surface Curing

The revisions in the specifications for the surface method of curing concrete with calcium chloride recently proposed By the Committee C9 on Concrete and Concrete Aggregates of the American Society for Testing Materials requires that the concrete surface be sprinkled just prior to the application of the calcium chloride, following the removal of the burlap.

The original specification required that the burlap remain saturated while in place which provision, if followed, insured the presence of sufficient moisture to cause immediate dissolution of the calcium chloride. The proposed sprinkling requirement would insure immediate dissolution of the calcium chloride and permit the use of a smaller amount, 1½ pounds per square yard instead of 2 pounds per square yard, for complete and uniform coverage of the pavement surface.

The proposed specification, in which the presence of sufficient moisture is assured, makes satisfactory the use of the calcium chloride surface method of curing concrete under low humidity conditions, for which it does not now apply. It provides complete covering of the surface and blankets the pavement, due to controlling the vapor pressure, so that the mixing water in the concrete is prevented from evaporating.

The reduction in the amount required for proper curing reduces the cost of this method one-fourth, as such little labor is required for application that special provision for taking care of this work is not necessary. It can be handled readily by the regular crew.

Cartoon by George Clark

"I Don't Want to Have to Tell You Again That You're Violating the First Principles of Construction Engineering!"

Bridge, Grade Separation Construction Last Year

During the year 1936, the state highway departments constructed 3,393 bridges of over 20-foot span and eliminated 858 railroad crossings, according to the annual report of the American Association of State Highway Officials. The list of states and the work accomplished is as follows:

States	Bridges Constructed	RR Crossings Eliminated
Alabama	85	21
Arizona	89	11
Arkansas	41	46
California	70	12
Colorado	279	45
Connecticut	32	3
Delaware	8	1
Florida	26	14
Georgia	93	...
Idaho	72	21
Illinois	312	52
Indiana	142	14
Iowa	74	42
Kansas	110	...
Kentucky	101	14
Louisiana	21	3
Maine	6	13
Maryland	20	17
Massachusetts	17	1
Michigan	9	14
Minnesota	111	88
Mississippi	128	63
Missouri	266	40
Montana	45	11
Nebraska	118	41
Nevada	4	10
New Hampshire	35	5
New Jersey	18	8
New Mexico	21	13
New York	118	16
North Carolina	72	20
North Dakota	25	4
Ohio	31	1
Oklahoma	124	29
Oregon	35	16
Pennsylvania	259	24
Rhode Island	2	4
South Carolina	11	10
South Dakota	21	12
Tennessee	37	6
Texas	32	38
Utah	11	5
Vermont	18	8
Virginia	65	21
Washington	22	7
West Virginia	20	2
Wisconsin	85	13
Wyoming	52	9
Total	3,393	858

Highway Bridge Surveys

This is the title of a new booklet, prepared by C. B. McCullough, describing with clarity and in considerable detail the importance of the various kinds of data needed in the design of bridges. Mr. McCullough, who is an authority on bridges, points out the necessity of a comprehensive and accurate bridge survey. Incomplete or inaccurate information may result in bridge failure, involving financial loss as well as possible loss of human life. All pertinent data for each bridge should be obtained and filed, as each structure built may be considered a practical experiment in bridge building.

In addition to its interest to state and county bridge engineers, the booklet also has great value to civil engineering instructors and students as a textbook.

Copies of this booklet, known as U. S. Department of Agriculture Technical Bulletin No. 55, may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price: 20 cents a copy.

Movies Show Building Of Golden Gate Bridge

A new motion picture of particular interest to contractors and engineers on the construction of the Golden Gate Bridge has just been released by the Bethlehem Steel Co. It is a talking picture with a descriptive lecture on the sound track. The picture gives a complete story of the construction of the bridge across the Golden Gate at San Francisco, beginning with the arrival of the steel at the bridge site and following through the erection schedule.

Many different problems in the construction of this bridge had to be solved and the methods used are discussed as the picture shows the progress of the work, including the erection of the steel towers to support the cables, the construction of the superstructure for the roadway and the unusual steel handling methods required by the great size of the structure.

New Fire Prevention Booklet

A new booklet "Preventing Welding and Cutting Fires" which has just been published by the Linde Air Products Co., 205 E. 42nd St., New York City, should be useful to all those interested in welding or cutting operations. Prepared as a part of the nation-wide program to promote safe practices among the users of industrial equipment, the booklet includes safe and sure rules for preventing the possibility of welding or cutting fires, as well as other pertinent information on oxy-acetylene welding.

Copies of this booklet may be secured by those interested direct from the Linde Air Products Co., by mentioning this magazine.

Keeping Roads Open

A new 32-page booklet describing the use of LaPlant-Choate hydraulically operated snow plows for use on state, county and township highways this winter has just been published by the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa. These plows, which are designed for use with Caterpillar tractors exclusively, are available in the V-type, box-type moldboard, blade and wing models for tractors from 22 to 75 hp.

The feature of these units is the LaPlant-Choate hydraulic control which makes it possible for the entire plow to be controlled from the cab by the operator of the tractor. The power is supplied by a simple rotary-geared pump, is applied by hydraulic jacks and directed by the valve in the system.

Copies of this new catalog No. 571 may be secured by those interested direct from the manufacturer.

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Uniform pressure, ventilated swing clutches—no grabbing—no jerking.
NORTHWEST
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Big Hot-Mix Plant For Wide Mass. Job

Bituminous Concrete for B. Perini & Sons' Job North of Boston Laid by Warren Bros. Roads Co.

THE middle contract of three contiguous highway projects in Massachusetts, costing an aggregate of $3,000,000, which were completed in October, consisted of two 34-foot roadways of bituminous concrete laid in three courses, two 10-foot parking lanes of penetration macadam and a 20-foot central grass plot with sloped concrete edging. Located in the towns of Lynnfield and Saugus, this 4.68 miles of widened road aids in the removal of a bottleneck which has throttled traffic on the Newburyport Turnpike and brought forth newspaper headlines like "Twenty-Five-Mile Traffic Jam" and "Motorists Fume at Holiday Delays on Pike."

This section connects at its southerly end with the new wide highway extending eastward toward Revere Beach which will be described in a later issue of CONTRACTORS AND ENGINEERS MONTHLY, and near its northerly end is intersected by the Northern Circumferential Highway which, when completed, will take motorists around Boston on a wide divided highway from Gloucester on the north to Quincy on the south and connect again with U.S. 1 on the outskirts of Boston, permitting travel south to Providence and New York without traversing the streets of Boston.

On the 4.86-mile project, FAP 3-9-17, constructed by B. Perini & Sons, there is only one intersection of a cross road at grade, and there are three overpasses with steel I-beam stringers, concrete deck, two abutments and a center pier in the grass plot. In addition there is the underpass of the Northern Circumferential Highway included in another contract. The bridges for the overpasses on the Perini job cost $167,093.45 while the highway contract was $1,349,895.25. Another safety measure on this contract was the complete separation of the two roadways on a 1,500-foot radius curve. The roadways are separated by the 20-foot grass plot at all points, but in addition, on the long curve where the headlights of on-coming cars on the inside of the curve would shine in the eyes of motorists driving cars in the opposite direction, the inside roadway has been elevated 10 feet above the outer roadway, thus allowing the headlights to shine over the cars on the other roadway.

We Bring in Superlatives

"Gentlemen, on this contract during the six months of maximum cold in the winter of 1936-1937 there was gathered together the greatest aggregation of colossal construction equipment on any job ever built in the six grandest states that comprise New England," saith the Barker from Massachusetts. There is truth in the statement, for included in the heavy equipment that Perini had working on the grading were fourteen 8-yard Euclid Trac-Truks, ten shovels from 1 to 2½-yard capacity, four wagon drills, four Caterpillar RD8 tractors with hydraulic bulldozers, and a 10-yard LeTourneau Carryall scraper stripping the loam and borrow pits.

Roadway Features

The entire roadway construction is underlaid with 14 inches of pit-run gravel for a base. When the parking lanes were under construction the granite curbing was in place and the spray from the pressure distributor would have practically permanently plastered the face of the curb, and at times the top, with asphalt. In order to prevent this every foot of the curb was covered with a light building paper weighted with stones to prevent its blowing away. Clean curbs is the result.

The central grass plot 20 feet wide for the full length of the job has been built up with the greatest of care to insure the full measure of protection for the grass and to minimize the attention necessary by the maintenance forces. The 6 inches of top loam is spread over 6 inches of peat of high water-holding capacity. The loam was stripped to a maximum depth of 3 feet from a 20-acre area while most of the loam was from a depth of only 1 foot. This work was done with shovels, cranes and scrapers.

The paved parking lane, 10 feet wide,

L. & E. M. Photo
The Truck-Mounted Sasgen Derrick, Unloading Precast Concrete Edgestones and, in the Background, the Two Elevations of the Roadway.

at the outside of each roadway, is comprised of a broken stone base, 2 inches thick compacted, bound with sand on a 13-inch gravel base and topped with a 2½-inch Penolithic wearing surface. There was a great deal of public utility work on this section of roadway, including the removal of the overhead line connecting with the Trans-Atlantic cable and placing it underground. The Postal Telegraph line was relocat-

(Continued on page 28)

Meet the Iron Hand IN THE Velvet Glove!

● Meet the operator of the Link-Belt Speed-o-Matic (hydraulic pressure control) shovel. He has plenty of power at his finger-tips . . . power that he can easily convert into big yardages.

Sitting in a comfortably cushioned seat, operating short easy-throw levers and pedals, he exerts a minimum of physical effort. He is not subject to efficiency destroying fatigue and is therefore able to keep the machine going at top speed all through the work shift.

Compare this ease of operation with the physical effort required to manipulate hand-lever machines which tire the operator and reduce his efficiency hour by hour. The increased output resulting from the use of Speed-o-Matic shovels is actually amazing. Send for Book No. 1795.

Visitors are always welcome at our Chicago Plant testing grounds to witness demonstrations of Speed-o-Matic machines.

LINK-BELT COMPANY 7181
300 W. Pershing Road, Chicago Distributors and Offices in Principal Cities

Now
LESS EFFORT
TOP SPEED

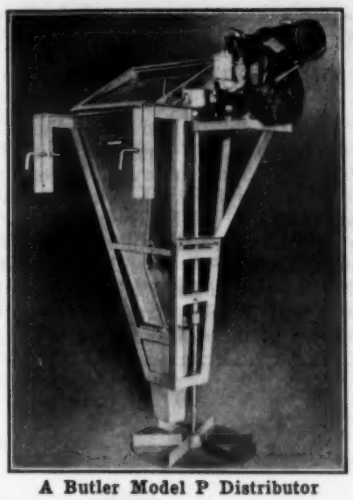
It is a known fact that the operator's physical capacity limits the yardage handled per day, not the mechanical capacity of the machine. Time studies prove that the Speed-o-Matic enables the operator to get 25% or more yardage than from the same machine with manual-lever control.

LINK-BELT
Speed-o-Matic SHOVEL
DRAGLINE - CRAN

New Distributor for Sand or Abrasives

The Butler distributor for spreading sand or abrasives on slippery roads or for spreading sand, pea gravel or other aggregate for black-top road construction, which is made by the Auburn Metal Products Co., Auburn, Ind., is quite different from the conventional type of sand spreader.

It consists of a hopper and chute of 24-gage galvanized sheet steel riveted to a frame of ¾ x ¾ x ⅛-inch angles. At the bottom is a circular distributing fan of 14-gage sheet steel with six 16-gage blades riveted to the fan. It is easily attached by hanging over the tailgate of a truck and may be driven by hand or by power. The operator rides in the truck bed. A heavy application can be put on at speeds of 5 to 15 miles an hour and lighter coats at higher speeds, according to the manufacturer. As the distributor is operated entirely independently of the truck, the material



A Butler Model P Distributor

may be spread whether the truck is going forward or in reverse.

Complete details on the two models, Model P complete with engine, and Model H for hand operation, are contained in literature which may be secured direct from the manufacturer by mentioning this magazine.

New Davey District Manager

The appointment of L. J. McLaughlin as Mid-Western District Manager of the Davey Compressor Co., Inc., Kent, Ohio, has recently been announced by that company. Mr. McLaughlin, who has had more than 20 years' experience in the equipment field, was formerly Sales Manager of the Hug Co.

A Correction

In the article "Better Rock Removal with Less Explosive" which appeared on page 27 of our August issue, there was a reference to a "Gardner-Denver air-cooled compressor." This was an error as Gardner-Denver does not make an air-cooled unit, the feature of its compressors being their water-cooling system.

This Hunter Safety Railing Has Withstood All Shocks of Collisions for Five Years with No Crash-Throughs and No Deaths

Bridge and Highway Rail Has 5-Year Safety Record

For the past five years, 50,000 feet of Hunter safety railing, made by the Hunter Steel Co., Neville Island, Pittsburgh, Penna., has been installed in various sections of hilly Allegheny County in Pennsylvania. During this time, the railing has established a perfect record against "crash-through" accidents, although it has been struck a great number of times, without a single resulting fatality, according to the manufacturer.

The Hunter safety railing acts like a safety net. The continuous members are bolted together and are attached firmly through each post. This gives a continuous or cable-acting recoil when struck, and the impact is absorbed by all the posts, giving continuous perpendicular as well as longitudinal resistance. It has a resiliency that rebounds, acting like the bumper on a car.

The posts are of rolled and pressed steel, in any I-beam and H-section size of metal thickness. The hand-rails, also of rolled and pressed steel, permit of simple but strong connections, and are accessible for painting, repairs, or removal to other structures. The deflectors are placed about 16 inches above the sidewalk or roadway and are connected through the posts, thus transmitting part of the stresses to other panels. The use of a steel skirt at the bottom of the railing permits the placing of a heavy bar between the deflector and the skirt, the inner edge of the bar being flush or nearly flush with the edges of the deflector and skirt on the roadway side, and the combined unit forming a T of which the bar is the stem and the deflector and skirt the head.

This railing may be fabricated and completely constructed by local mills and iron shops through arrangement with the Hunter Steel Co., thus lowering the cost of this safety railing.

Complete descriptive literature and detailed blueprints may be secured by those interested direct from the manufacturer by mentioning this magazine.

Symposium on Lubricants

The papers and discussion comprising the 1937 Symposium on Lubricants held at the Chicago Regional Meeting of the American Society for Testing Materials summarize and bring up to date available information on motor oils and their applications. This symposium is limited to lubricants for motor car engines.

The subjects discussed include the causes and effects of engine deposits, the effect of design and composition of automotive bearings on lubricants, how to select a motor oil from the standpoint of the consumer, and other subjects such as oil viscosity, etc.

Copies of this symposium, in an 89-page heavy-paper-covered volume, may be secured from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa. Price: $1.25.

Joyce-Cridland Adds to Plant

The Joyce-Cridland Co., Dayton, Ohio, manufacturer of Joyce auto lifts and jacks, has just completed a new single-floor steel frame building of monitor-type construction with four-fifths of the wall area in glass to facilitate precision workmanship. The building is laid out so that the work moves along a continuous production line, from raw stock to finished product.

This company was founded in 1873 to build railroad jacks. Hydraulic automobile lifts were added in 1928. Three other factory buildings have been outgrown in the progress of this company. J. M. Switzer is President and Huston Brown, Vice President.

New Link-Belt Vice Pres.

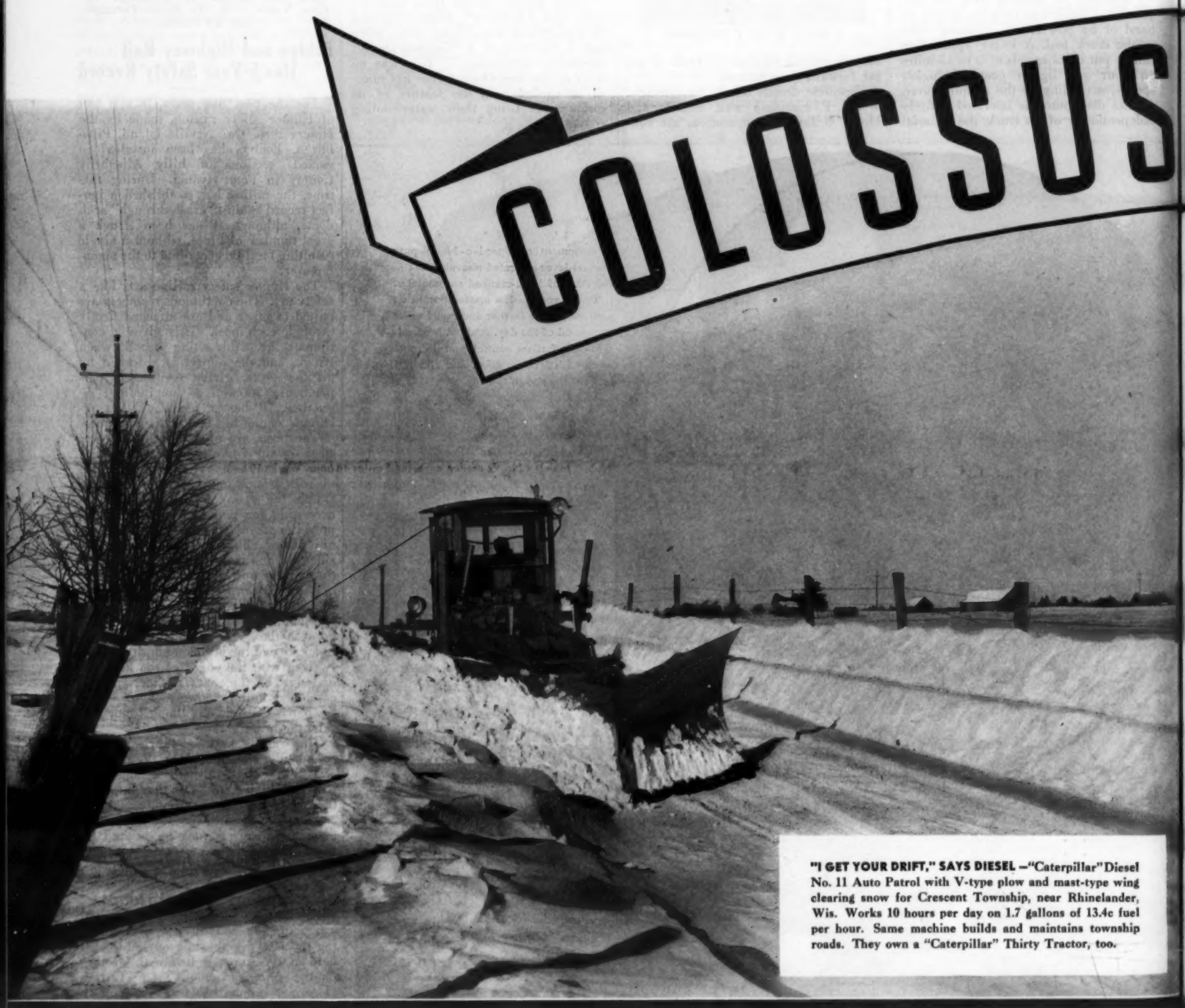
Announcement has been made by the Link-Belt Co., of Chicago, Ill., of the election of William C. Carter and Edward J. Burnell as Vice Presidents of the company. Mr. Carter, who has been associated with the company since 1902, has been in charge of production and Mr. Burnell, with Link-Belt since 1913, has been general manager of the Pershing Road plant in Chicago.

The 1938 Road Show

From the American Road Builders' Association comes the word that the 1938 Road Show to be held in conjunction with its convention in Cleveland January 17-21 will be the most spectacular exhibit of road-building equipment and materials ever assembled. The display of so much large and heavy equipment will include many new features.

Some of the exhibit statistics are of interest. The largest single application for space is for 16,000 square feet and the largest application from a single company is for 9,000 square feet. The next is for 7,700 square feet and there are fifteen applications for space of 2,000 to 5,000 square feet.

The heaviest piece of equipment listed to date is a shovel weighing 125,000 pounds and the greatest height listed is 35 feet, although the shovel will greatly exceed this. Under consideration is a single exhibit 43 feet wide, 53 feet long, 50 feet high, weighing 200,000 pounds. We are invited to guess what it is!



"I GET YOUR DRIFT," SAYS DIESEL—"Caterpillar" Diesel No. 11 Auto Patrol with V-type plow and mast-type wing clearing snow for Crescent Township, near Rhinelander, Wis. Works 10 hours per day on 1.7 gallons of 13.4c fuel per hour. Same machine builds and maintains township roads. They own a "Caterpillar" Thirty Tractor, too.

Technological Changes In Construction

The recent report of the National Resources Committee "Technological Trends and National Policy" points out that technical improvements in construction have tended to sustain activity and employment at levels which, very likely, would not otherwise have been maintained. This is quite contrary to the effects in other industries.

Through their effects on costs, technical improvements have also enlarged the physical volume of works possible with a given allocation of funds, particularly by public agencies. According to the estimates of the U. S. Bureau of Public Roads, the expenditure, which in 1922 built 100 miles of highway, would have built 124 miles of that same type of highway in 1930 and 170 miles in 1932. This was possible, not at the expense of wage rates which were substantially higher in 1930 than in 1922 and approximately the same in 1932 as they were 10 years before, but almost wholly through technical improvements in the various processes of highway construction.

A Motor-Compressor Unit

The Ingersoll-Rand Motorcompressor described in a new Bulletin No. 3166 recently issued by the Ingersoll-Rand Co., 11 Broadway, New York City, is a stationary vertical single-acting two-stage air-cooled air compressor. The feature of it is that the motor and compressor are combined in a single compact unit. Sizes range from 15 to 75 hp for discharge pressures of 80 to 125 pounds per square inch. Piston displacements range from 79 to 445 cubic feet a minute.

Copies of this Bulletin No. 3166 may be secured without obligation direct from the manufacturer.

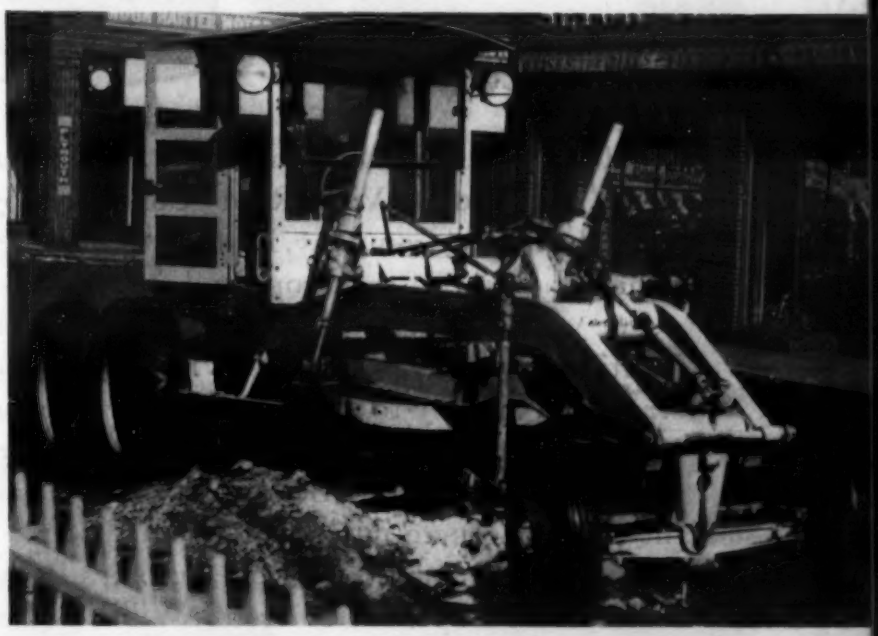
Equipment Dealer Moves

The Bublitz Machinery Co., of Kansas City, Mo., recently appointed distributor in that territory for the Austin-Western Road Machinery Co. and the Cleveland Tractor Co., has moved to new and larger quarters at 2305 Pennway where increased facilities will make possible a more complete service to the construction industry.

OF ROADS

DAY AND NIGHT, week after week, month upon month, "Caterpillar" Diesel Auto Patrols work without rest, keeping roads clear of snow and slush in Winter; scarifying, blading, grading them in Summer, for up-and-coming communities that want to cover the most ground in the least time and with the least wear-and-tear on the budget. Diesel Auto Patrols are the first to break through deep-drift roads, the first to restore Summer width to Winter-worn roads. They are a year-round investment, as many a community has proved to the taxpayers' satisfaction.

DOUBLE-DUTY DIESEL—In addition to pushing its own blade, the "Caterpillar" Diesel No. 11 Auto Patrol has enough power to pull a No. 22 grader, covering 3 miles an hour. Works 10 hours a day, uses 1½ gallons of 8½c fuel per hour.



DES MOINES HAS 4 OF THEM—No. 11 Auto Patrol clearing 11 to 15 miles of ice and snow from Des Moines streets. Snow-plow formerly used cost $2.05 per hour, cleared but 5 to 7 miles per day. Diesel Auto Patrol does nearly twice the work for only $1.06 per hour.

TRACTOR CO., PEORIA, ILL.

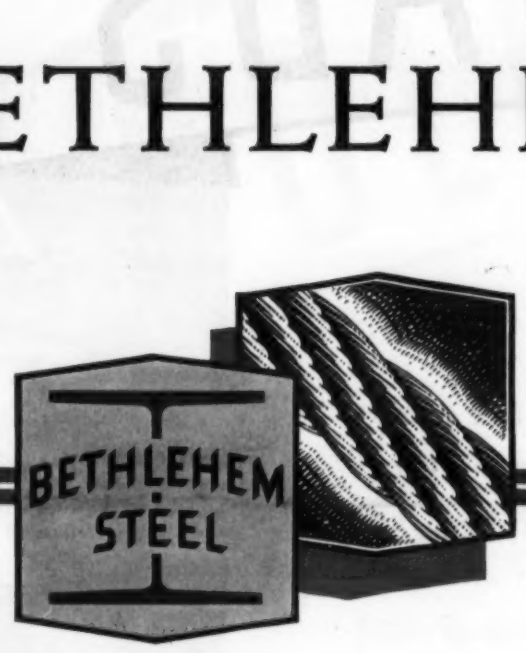
"CATERPILLAR" DIESELS DO THE WORLD'S WORK

LARGEST MANUFACTURER OF DIESEL ENGINES, TRACK-TYPE TRACTORS AND ROAD MACHINERY

Wire Rope and Strand

now products of

BETHLEHEM



WITH the recently-announced acquisition of Williamsport Wire Rope Company by Bethlehem Steel Company, Bethlehem becomes a manufacturer of wire rope and strand.

For years the name Williamsport has been identified with dependable wire rope and strand. Not only to men who have been using Williamsport products, but to all other wire-rope and strand users, Bethlehem's entry into this field marks an important forward step.

As Williamsport Wire Rope becomes Bethlehem Wire Rope, customers of Williamsport Wire Rope Company can look with assurance to Bethlehem to maintain the quality standards associated with Williamsport products. Advantages to the user may naturally be expected to accrue from the broader manufacturing and servicing facilities offered by the Bethlehem organization.

Customers of Bethlehem Steel Company can now obtain a complete line of wire rope and strand from the same source which furnishes their other steel requirements, and made to the same quality standards as those that govern in the manufacture of Bethlehem alloy and tool steels, plates, sheets, and other products.

Wherever and however you use wire rope and strand you will find Bethlehem a source of well-made, dependable material, serviced by men whose long, first-hand experience in analyzing and solving wire-rope problems is a background for authoritative recommendations on the most suitable grade of Bethlehem Wire Rope for any task.

BETHLEHEM STEEL COMPANY

Atchafalaya Floodway Program in Louisiana

(Continued from page 1)

Morganza so that flow into the Atchafalaya Floodway will not begin until the Mississippi River shall reach a stage of 49 feet on the Angola gage.

This differs from the original Jadwin Plan only in a greater control of the use of the floodway. Jadwin proposed a fuse plug levee to be breached whenever the river overtopped it. The actual method of control by some kind of weir and the point of construction have not yet been determined, but work on the levee systems has been carried on consistently with the funds available.

The Program

Some of the richest land in Louisiana is located just north of Morganza and this area will be protected from floods, when the floodway is opened to relieve the Mississippi River levees, by the construction of the Pointe Coupée levee.

On either side of the Atchafalaya River, main levees confine the normal flow of the Atchafalaya River up to a major flood. The 1937 flood waters were confined by these levees with a total flow of 450,000 second-feet. The main levees will be extended to the south as the channel develops so that the flow may be confined to the greatest elevation possible without jeopardizing the levees to the north. A new main channel of the Atchafalaya River is being dredged as a part of this program, using all the natural water courses possible to speed the work and minimize the costs.

East and West Guide Levees

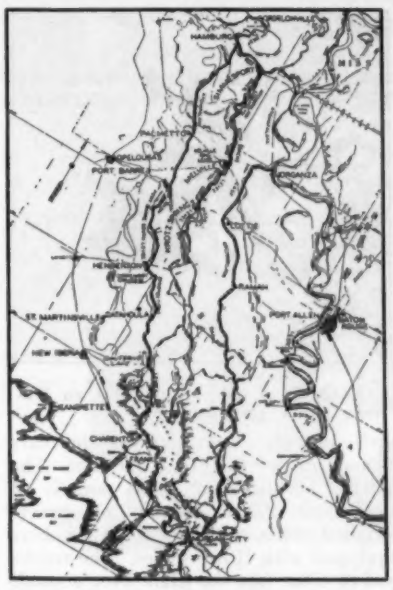
The East Guide Levee is now complete from Morganza through Lottie, Ramah and south to the north city limits of Morgan City. The section around Morgan City and the definite location of the section south of the city to the Gulf have not been determined. There are two gaps in this levee at bayou crossings left open for navigation until channels can be provided by connecting existing waterways to the east, and five gaps for railroads and highways. There are 4 miles of the levee south of Morganza completed only to interim grade. About 25 per cent of the remaining levee has been carried only to interim grade and will be carried to ultimate grade at a later date. The construction of the levees in two stages is valuable for two reasons: protection is afforded the area from all but the most excessive floods by construction to interim grade; and as the foundation on which the levees are being built is not as firm as that required for the main river levees, there will be some subsidence due to the weight of the levee itself. It is better therefore to await this settlement than to build to the ultimate grade in the initial construction.

The West Guide Levee is complete, except for six small gaps for railroad and highways, one bayou gap and a gap at Grande Avoille Cove, from Hamburg to Charenton Beach and has been carried to ultimate grade.

Drainage Between Levees

The drainage of the area west of the West Guide Levee will be carried through landside borrow pits to Charenton and thence by canal through Baldwin to the Gulf. The drainage east of the East Guide Levee will be carried by the landside borrow pits from Morganza to the Upper Grand River and thence through natural water courses to the Gulf.

The Wax Lake outlet for the Atchafalaya River when constructed will supplement the Morgan City outlet. It will involve the handling of 50,000,000 cubic yards of materials by dredge and in the levees and will require over two years for completion from the time it is started.



Location of Atchafalaya River and Protection Levees

Equipment Used in Project

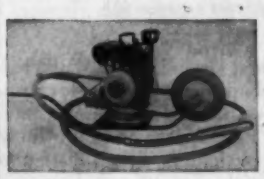
The Atchafalaya Floodway project was started as a part of the 1928 flood control program but work in the Atchafalaya Basin did not begin on a large scale until 1932. The program as now under way is being done under the Act of 1928 as amended by the Act of 1936.

On the East Protection or Guide Levee there are two Monighan draglines and three clamshell dredges at work. On the West Protection Levee there are five hydraulic dredges in operation and on the main channel of the Atchafalaya River there is one more hydraulic dredge.

The entire Atchafalaya Floodway Project is under the direction of the Second New Orleans District, U. S. Engineer Department, Lieut. Col. William F. Tompkins, District Engineer, and Capt. Chester K. Harding, Area Engineer.

ROETH VIBRATOR

with special features:



4 H.P. Engine; swivel base; wheelbarrow or two-wheel chassis. 6000 to 7500 R.P.M. Pulley ratio 1 to 3. Long life flexible shaft. University laboratory tests prove, on stiff concrete, that vibrator operating at 7000 R.P.M. will do FOUR times as much work as operating at 4000 R.P.M.

ROETH VIBRATOR COMPANY
1735 FARRAGUT AVENUE, CHICAGO, ILLINOIS

BINKS ROAD STRIPER

Will Save You Time and Money

Uniform, well coated stripe laid down much faster and better than by hand method.

Write for complete information.

BINKS MFG. CO.
3114 Carroll St.
Chicago, Ill.

For safe OVERLOAD lubrication..and
10 TIMES MORE DIESEL SERVICE HOURS

SINCLAIR
TEN-OL
REG. U. S. PAT. OFF.

Highway emergencies...landslides...snowslides...often force long overload service on "Caterpillar" Diesel auto patrols. Lubrication with Sinclair Ten-ol is the sure way to obtain full protection for rings and liners, and sustained delivery of highest engine output under the toughest operating conditions. There is a special grade Ten-ol—20 W—for winter service.

Ten-ol is a new fused lubricant developed by Sinclair for all types of "Caterpillar" Diesels. It gives continuous top performance at lowest operating costs, and ten times more Diesel service hours than the finest straight mineral oil.

Order Sinclair Ten-ol, Sinclair Diesel fuel, and other Sinclair products from your local Sinclair office, or write Sinclair Refining Company (Inc.), 630 Fifth Ave., New York, N.Y.

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Sinclair TEN-OL is recommended as a "new outstanding Diesel engine lubricant" by Caterpillar Tractor Co.

Highway Paving In Western Tenn.

A Well-Run Concrete Job North of Lexington, Tenn. Completed by Memphis Contractors

(Photos on page 40)

WITH good organization Walker & Michael pushed to speedy completion the 6.057-mile concrete paving contract, FAP 251-B, on State Route 22, north of Lexington, Tenn., last summer. The work was started June 25, 1937, and completed well within the 125 working days allowed. The pavement has the present specified cross-section of 8-6-8 inches on either side of the center line of the 20-foot slab with parabolic curves for both the subgrade and the concrete surface.

Fine Grade and Forms

The soil through which this contract ran is a sandy clay which runs to sticky mud when wet and when dry may be either very dusty or solid as rock, depending on the varying proportions of the sand and clay. The grade ahead of the forms was cut fairly close to fine grade with a Caterpillar No. 10 Auto Patrol and then a Ted Carr Formgrader cut the trench for the Blaw-Knox 8-inch forms with an 8-inch base. The trench was cleaned out by a crew of four men and then the form-setting crew of five men put in the forms firmly for the operation of the R-B power Finegrader which carried a ramp for the passage of the batch trucks over the top. The line of earth against the forms behind the Finegrader was shoveled out by one man on each side, leaving a clean grade for the 10-ton Galion gas roller to compact.

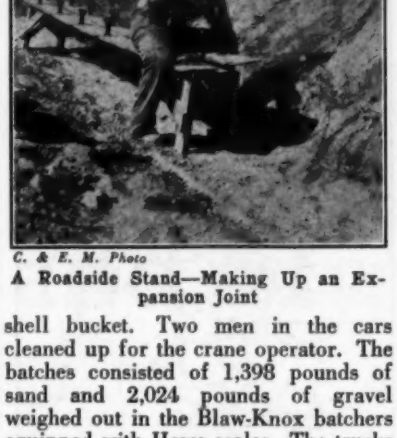
Behind this outfit came the boss form liner and two helpers to take every kink out of the forms after the other equipment had done its best to get it out of the original line. To prevent the subgrade from absorbing water from the concrete and to permit safe and fast operation of the batch trucks which turned through a break in the forms the grade was sprinkled thoroughly, and sometimes a bit too enthusiastically, by a hose man.

The expansion joints were assembled on the shoulder by a man who used a frame for supporting the ¾-inch Elastite expansion joint material while he carefully bolted the J-Bar dowels to the material, six to a 10-foot section, using a very small bolt. As this man moved forward over the rough shoulder to make up the joints as needed he carried the J-Bars with him in a box on a rubber-tired wheelbarrow with pipe handles.

Batching

The batching plant was set up at the way-station of Timberlake, about 4 miles north of Lexington, where the batching was done for the entire job. The pavement was first laid from Lexington north to the plant and then from the north end of the job back to the plant. There was a dead haul from the plant to the road of about ½ mile.

The aggregate cars were placed on a siding and unloaded by a Koehring 401 crane with a 1-yard Blaw-Knox clam-



C. & E. M. Photo

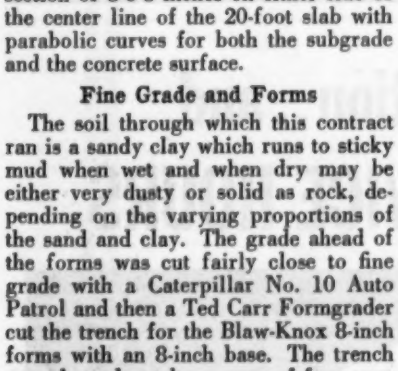
A Roadside Stand—Making Up an Expansion Joint

shell bucket. Two men in the cars cleaned up for the crane operator. The batches consisted of 1,398 pounds of sand and 2,024 pounds of gravel weighed out in the Blaw-Knox batchers equipped with Howe scales. The trucks had to come into the plant over a small bridge crossing a culvert where even a slight rain was liable to make a sloppy situation for hauling. The contractor took care of this by laying down a heavy lumber runway for about 100 feet so that the trucks would have firm going under all conditions.

The cement platform which ran the length of two box cars was made with two bridges for loading the 585 pounds of bulk cement per batch to the trucks. This simple method of handling trucks in fast succession is used all too infrequently by concrete contractors who seem to stick to the single bridge by force of habit. The Fairbanks scales for weighing the loaded Kone Karts was located at the center of the platform within easy reach of both cars and both bridges. Two men shoveled in each car and two men wheeled from each car, taking turns to make it possible for the men to get out of the hot dusty cars as frequently as the work permitted.

One of the cement bridges was twice the length of the other so that two trucks could back in at the same time

(Continued on page 19)



TOUGH

Dixon's Cup and Pressure Gun Graphited Grease is tough—defies heat, cold, dust pressure, and dampness where other lubricants squeeze out, melt out or wash out. It gives superior lubrication—and lasts longer than ordinary grease—saving lubricants and saving lubrication cost. In six consistencies.

At supply houses everywhere or write for Booklet R-148.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.

AND WHAT A HELP THESE ARE

SEND FOR CIRCULARS

7478

THESE FEATURES CONTRACTORS—TAKE ADVANTAGE OF

Available with either Diesel or Gas power.

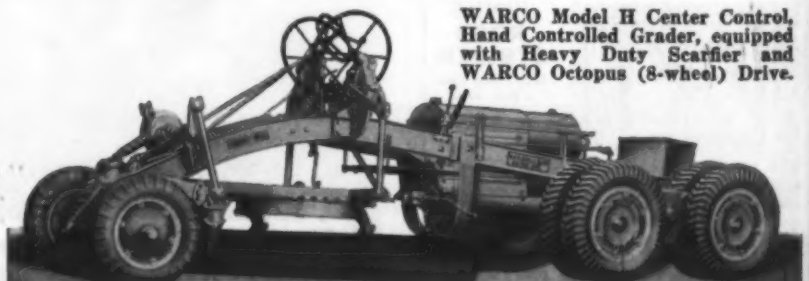
An announcement which all road builders will appreciate is the fact that the WARCO Motor Graders can now be secured with either Gas or Diesel Power, Center or Rear Control, Hand or Power Operation. Traction Equipment to suit requirements: Octopus (8-Wheel), Octopus-Tandem (4-Wheel) Tandem Drives, Dual Tired Rear Wheels, or Modern Heavy Duty Steel Rear Crawlers can be secured on any model.

The Model Thirty-three Power Controlled, Rear Control Machine shown above, is a Modern, Up-to-the-minute Machine, Stream-lined, Power Controlled, Massive Circle, Heavy Duty Scarifier, Tandem Drive, powered by Gasoline or Diesel engines.

The Heavy Duty Model H Center Control shown below, is capable of doing a vast amount of Construction Work. Built for stability and performance this machine meets the requirements of the contractors; also obtainable with either Gasoline or Diesel Power.

Warco Graders are noted for their outstanding
STABILITY AND PERFORMANCE

MANUFACTURED BY
W. A. RIDDELL CORPORATION
BUCYRUS, OHIO



WARCO Model H Center Control, Hand Controlled Grader, equipped with Heavy Duty Scarfier and WARCO Octopus (8-wheel) Drive.

North Dakota's Snow Problems

(Continued from page 1)

are blocked higher after each successive storm due to the high drifts pushed up on the sides of the roads by the push plows, with no means of getting it off.

Last winter was very severe. The snow formed exceptionally hard drifts and in many instances iced down, so that our largest heavy-duty trucks made slow progress. Our rotaries were the only units that could open some sections of highways. We worked our large 10-ton trucks in tandem, attempting to open secondaries which were blocked for ten to twelve weeks and the strain was terrific on both trucks and plows, causing a great deal of breakage.

Organization of Work

Our general procedure in snow removal is as follows: the generally mild first snow is removed by motor graders, light trucks with one-way plows and motor graders equipped with V-type push plows. When these are no longer effective, we start using our heavy truck equipment. As shown in the list of equipment below, most of the heavy units are equipped with hydraulically controlled wings and are very effective in widening until such time as the rotaries are needed.

After a storm abates, our heavy equipment is used in opening the highways enough for traffic to pass. Following this, the motor graders clean the surplus snow left by the push plows from the surface and blade it into windrows on each side of the road. The rotaries then follow up in their widening work. Many drifts are so high that it is necessary for the trucks to pull down the snow with the wings in order that the rotaries may function properly. After a severe winter, we attempt to widen secondaries with the rotaries just before the spring break-up.

Our method of obtaining information on and reporting road conditions is to assign employees to 30 to 50 miles of highway each over the entire system. Every morning when there is any doubt of the road being open, each employee patrols his section and reports its condition to the Division Office before 9 A.M. After the Division Office receives all these reports, they make up a telegram and submit it to the Main Office in Bismarck. We then prepare a state wide highway condition bulletin which is broadcast each day over the entire state. We do not issue a weekly road condition bulletin as most states do because of inadequate finances. However, the Greater North Dakota Association issues a bulletin of this type, securing the information from the various Division Offices by wires each week.

Equipment

The State Highway Department owns and operates forty-three snow plow units of the following makes and sizes: two International dual tandem rear-wheel-drive 15-ton trucks, equipped with St.Paul 459 combination platform and dump box, without hoist; three Walter, four Oshkosh, six FWD and two Coleman all-wheel-drive 7 to 10-ton trucks; one Walter, three Oshkosh and two FWD all-wheel-drive 3½ to 7-ton trucks; seven 1½ to 3-ton trucks of various makes; six motor patrols equipped with V-type push plows; and seven Sno-go auger-type rotary plows.

The 15 and 7 to 10-ton trucks are equipped with the largest V-type plows made by the Wm. Bros Boiler & Mfg. Co., Royer Mfg. Co., American Hoist & Derrick Co., Wausau Iron Works and Carl Frink. These trucks are also equipped with American, Bros and Wausau hydraulically controlled wings. The smaller trucks are equipped with smaller Bros, American and North Star V-type plows.

Up until this year we have used all-wheel-drive trucks almost exclusively, but last fall we purchased two 15-ton tandem dual rear-wheel-drive trucks and must say that they are standing the heavy work excellently and do all that can be expected both in bucking open and widening drifts. We were skeptical of their value in widening work be-

(Continued on page 21)

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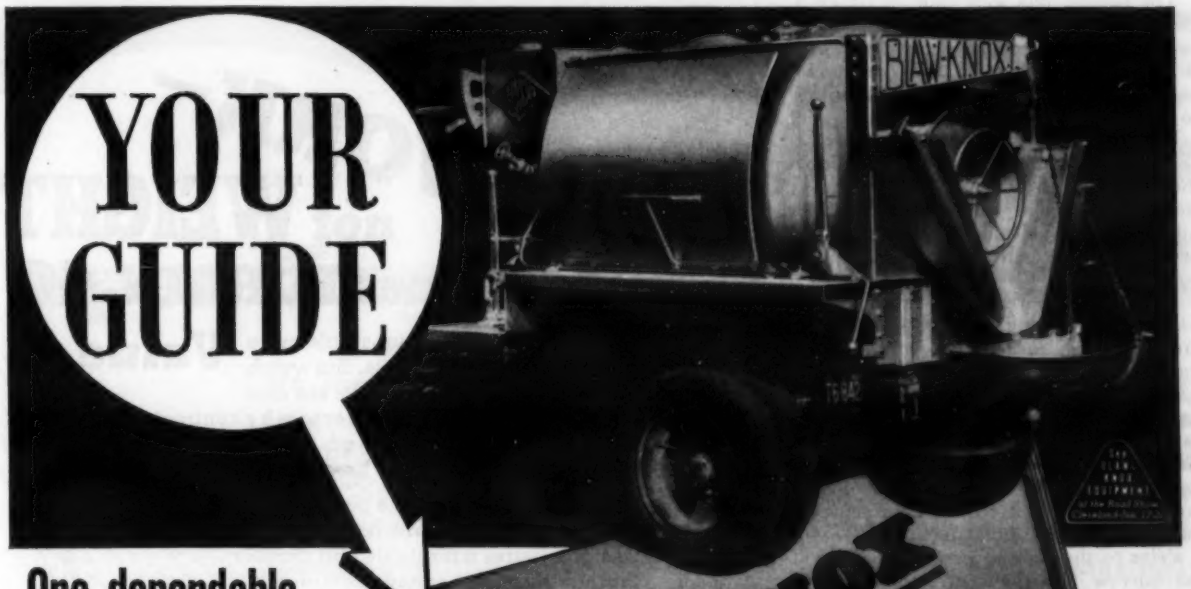

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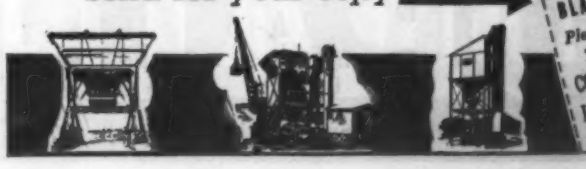

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Water Supply Dam For Little Rock

(Continued from page 2)

up September 30, 1937. The maximum 24-hour production of material placed in the dam section was 9,000 cubic yards and the average 6,000 yards. Some delays were necessary in shifting the loading units frequently because of the results of the soil tests. The night production held up to the day shifts as a result of the lighting described below.

Brayton subbed 100,000 cubic yards of dam embankment and the spillway excavation, which was wasted, to Clark, Kearney & Stark of St. Louis, Mo. They used two Euclid side-dump crawler wagons, two Hug trucks and two Euclid Trac-Truks during their contract, which ran during April and May, 1937.

Character of Borrow Pits

The borrow pits were thoroughly explored, before the contract was let, in a manner far more complete than is usual on a contract of this character, and all the results were made available to the bidders.

The west pit below the dam varied completely from the other pits in that the clay was beneath the gravel instead of on top as in all others. This pit had to be abandoned because of excess moisture in the impervious material.

Some of the borrow pits, after being worked for varying periods, showed a large increase in boulders and a reduced amount of binder material. The contract called for 4,000 feet of free haul from the borrow pits measured as a radius from the center of the dam. Every endeavor was made to find satisfactory material within this area even though it required an actual haul greater than 4,000 feet.

Prior to the start of excavation from the borrow pits the contractor dug a main drainage ditch through the upstream or main borrow pit with laterals every 100 feet to maintain the material as dry as possible. Much of this work was done during the winter shutdown to make it possible to open the pits quickly after the winter rains.

Placing Material in the Dam

The contractor used the bottom-dump and spread method of placing the material in the dam section. He maintained a center road across the center line of the dam and ran the hauling units off at an angle from the center road. After dumping as directed by the spotter and without stopping or even slowing down, the units drove back over the fill. The material was spread quickly by a Caterpillar Thirty-Five with a Euclid bulldozer, an Allis-Chalmers Model L with the same type of bulldozer and another A-C Model L with an Ateco hydraulically operated bottomless scraper.

"Seventy-mile roads" was the way the Superintendent described the hauling roads for the full and empty units. We agree that they were unusually smooth for this kind of a job and were a good investment as the trucks were able to run at speeds as high as 35 miles an hour, according to our speedometer. The roads were kept in order by a Caterpillar No. 66 blade pulled by an A-C LO tractor and an Allis-Chalmers patrol grader.

Water for sprinkling the fill was furnished by a 6-inch Jaeger Sure-Prime centrifugal pump located in the diversion channel at the upstream toe of the dam. Water was pumped up to a loading point through a 14-gage 6-inch steel pipe line welded together on the job and extended as the height of the dam embankment required. At the upper end a section of inner tube from one of the large-tired machines furnished the flexible connection for delivering the water to a 1,000-gallon tank mounted on a Mack truck. A 4-inch pipe perforated for its 10-foot length spread the water on the fill as directed by the soil engineers. The pump furnishing the water idled continuously and was speeded up by remote control for filling the truck tank in three minutes.

The sprinkled fill was rolled continuously after the spreading in 8-inch layers, with maximum 6-inch rocks allowed, by using tandem Blaw-Knox sheepsfoot rollers pulled by an Allis-Chalmers WK tractor. As oversize stone worked to the surface during rolling, a crew of ten men hand-picked the stone and loaded them onto a stone boat pulled by a small tractor. This outfit handled only the larger stone. The smaller stones were loaded into two flat-bed trucks and all rock was used in the riprap. When the run of stone was unusual the Superintendent pulled in the grubbing crews to help pick rock and roots from the dumped material.

Where the fill was unduly compacted in the roadway by the heavy hauling units it was necessary to scarify the material to secure a satisfactory bond for the next lift. This work was done by

(Continued on next page)

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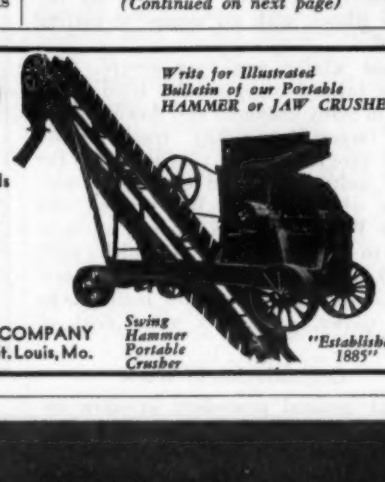
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Fast Dirt Moving Features Dam Job

(Continued from preceding page)

a Big Roman tandem disc pulled by one of the bulldozer tractors.

In order that the contractor and also the men themselves might know the work that was being done by the various hauling units a checker sitting at a point by which all hauling units must pass marked off every load and posted it on a blackboard. Set up next to the current board was the one for the previous day showing what each hauling unit did on each shift. This comparison was a great aid in keeping every driver on his toes. Breakdowns and time out for greasing were the only delays that kept the drivers from hustling back and forth between the shovel or dragline and dump.

Shifts and Lighting the Job

The Alum Fork Dam contract was run three 8-hour shifts daily for six days a week. The shifts ran from 6 A.M. to 2 P.M., 2 to 10 P.M. and 10 P.M. to 6 A.M. The shifts were moved back one shift each week so that over a period of time each group of men worked all three shifts and no favoritism was shown.

As was mentioned before, the night shifts produced as much dirt as the day. The reason for this was the careful lighting of the pits and dam. Each excavating unit had a 500-watt Kohler lighting unit as standard equipment for lighting the pits where they were working. In addition there were the lights on the hauling equipment and three lighting towers composed of windmill tops mounted on sturdy timber bases carrying 2-kw Kohler lighting plants covered to protect them from the weather. Two of the towers had three-way lights and the other was equipped with two-way lights.

Equipment Maintenance, Telephones

A complete greasing and machine shop with a well-ordered parts department was maintained right down beside the dam close to where the hauling units were rushing by throughout the 24 hours. The day shift of the machine shop and greasing crew consisted of eleven men, with seven on the night shift. The master mechanics worked only during the day as the major repairs were made then.

The draglines and shovel were greased by the operator and oiler on each shift. The Euclid Trac-Truks were pulled out of line one at a time for greasing at the shop. This same method was used for all the mobile equipment like tractors and graders. The local Texaco distributor ran a tank truck out onto the job and fueled the shovel and draglines and the light plants once a day. All other equipment was fueled when it was pulled in for greasing. At the shop were three fuel tanks, one for diesel fuel, one for tractor fuel, and one for gasoline.

C. & E. M. Photo

The Mack 1,000-Gallon Sprinkler Taking Another Load of Water

The greasing equipment at the shop was all Alemite high-pressure guns with compressed air for power. A small portable Ingersoll-Rand compressor provided air for inflating tires and for the operation of the grease guns. Marfak grease and Texaco gear lubricant and motor oil were used.

At the machine shop was a full line of grinders and drills all electrically operated by power from a Kohler 2-kw plant and a Lincoln arc welder for repairing equipment, particularly the teeth on the shovel and dragline buckets which seemed to wear rapidly in the type of soils being handled at Alum Fork.

A five-station telephone system was installed for the job with connections at the Field Office, the Machine Shop, the Commissary, the Superintendent's Office and the Superintendent's home. In addition there were outside telephones at the Main Office, the Superintendent's Office and the Contractor's Commissary.

Spillway Construction

The concrete for the spillway was subbed to William Peterson of Little

(Continued on page 23)

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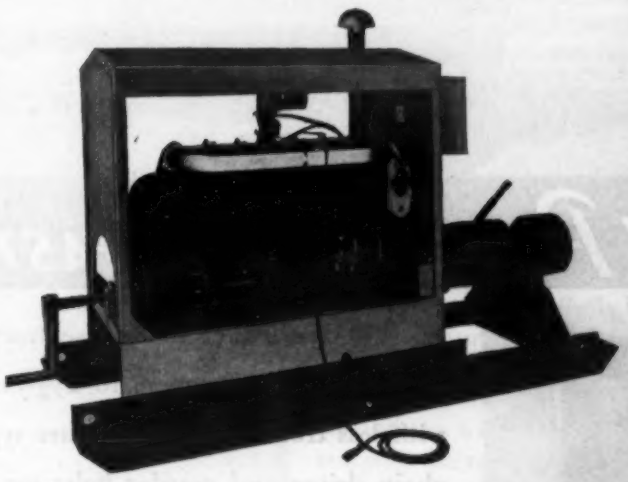

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Gila Valley Irrigation Project

First Unit of Canal Which Will Water 150,000 Acres In Arizona and Will Cost $20,000,000 Well Under Way

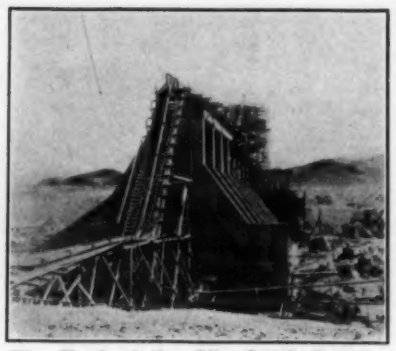
By JOSEPH C. COYLE

(Photo on page 40)

THE gravity section of the Gila Valley Irrigation Canal, 17 miles long, is well under way, including two tunnels through the Laguna Mountains which are construction features not included in the sister project, the All-American Canal. Also, while power drops are featured in the course of the latter, the Gila project will encounter rising elevations beyond the unit now under construction, which will require the use of power from Boulder and Parker Dams for pumping. The present development will irrigate lands in the Gila River valley. Extensions planned would irrigate 139,000 acres on the Yuma frostless mesa, extending southward along the Gila mountain range to the Mexican border and west to the Yuma valley.

The canal, with headworks at the Arizona end of the Imperial Dam, is 22 feet wide at the bottom and 76 feet at the water line. The water will be 13½ feet deep, with 6-foot freeboard. Excavation is on an offset line, to provide for later widening on the upper side to 100 feet at the bottom and 154 feet at the water line. This final development would require additional tunnels through the Laguna Mountains and 2 miles of tunnel through the Gila range, and would water the Mohawk and San Cristobal Valleys east of that range, bringing about 435,000 acres more under irrigation, or a total of 585,000 acres. Most of this is now government land, and will be opened for settlement a little at a time in the future. The total cost of the first unit, watering the 150,000 acres in Gila Valley and the Yuma mesa, is estimated at $20,000,000, to be repaid without interest, over a period of 40 years, by the Gila Valley Irrigation District.

Three settling basins at the head of the canal will be 1,200 feet long, with a side slope of 2 to 1 and a top width of 227 feet. They will be bordered by compacted embankments, with a 6-inch blanket of pit-run gravel, topped with 8 inches of concrete. The site of the basins and transition has been explored by government forces with 6 and 8-inch test holes, some drilled as deep as 110 feet, using a Bucyrus-Armstrong 33 well drill. Some 1,800 60-foot wood-bearing piles will be driven under the area. The headworks, as well as the canal itself down to Sta. 30, will be constructed by Morrison-Utah-Winston, general contractor for Imperial Dam. This portion of the canal, carried to Sta. 2300 between embankments, the lower of which is compacted, has already been completed by the subcontractor, George W. Condon of Omaha, Nebr.



The Head of the Gila Canal Showing the Arizona End of Imperial Dam

Condon Subcontract

Twenty-foot wood sheet piling was driven beneath the compacted embankment with a McKiernan-Terry steam hammer, and dirt for the embankment was hauled from adjacent borrow pits with a fleet of Euclid Trac-Truks, loaded by a 2¾-yard Northwest shovel, and spread in 6-inch layers with bulldozers on Allis-Chalmers tractors. This was sprinkled with an International tank truck and compacted with tandem sheepsfoot rollers. The top of this embankment is 30 feet wide, with side slopes of 2 to 1, the outside slope being blanketed with rock on a 2½ to 1 slope. The upper uncompacted embankment has a 2 to 1 inside slope and 1½ to 1 outside slope.

Schedule 1

Boyce & Igo Construction Co., of Baton Rouge, La., has completed Schedule 1 of the canal, consisting of 790,000 cubic yards of common excavation, 15,000 cubic yards of rock and 50,000 cubic yards of excavation for drainage channels and dikes. The contract price was $73,200. From the end of the Condon job, at Sta. 30, the schedule was largely loose desert sand, with a sparse

(Continued on page 20)

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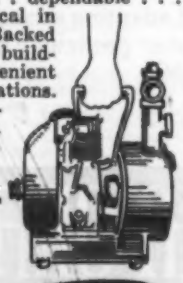

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New Industrial Sales Head For International Harvester

The International Harvester Co. of Chicago has announced that the continued expansion of its industrial tractor and power unit business has necessitated a realignment of its sales department personnel, as a result of which Neal Higgins has been placed in charge of all industrial tractor and power unit sales while R. C. Flodin, formerly in charge of this division, has been assigned to a new post.

Mr. Higgins has been associated with the company for the past 5 years and has been closely identified with its industrial sales during that time. Mr. Flodin's new position is that of coordinating the work of engineering, manufacturing and sales as applied to both the industrial and agricultural lines, and W. M. Parrish will continue to work with the manufacturers of allied equipment in the development of new applications of International power.

Know Your Ropes

This is the title of an 82-page manual of wire rope selection, application and usage that tells you how to make your wire rope last longer, published by the Wickwire Spencer Steel Co., 41 E. 42nd St., New York City. This unusually interesting and informative booklet covers practically the entire field of the proper use of wire rope, its selection for the requirements of a particular job, the importance of its lubrication, how to attach and splice it, and in general how to get the most service with safety.

Copies of this booklet, which should be of value to all contractors and engineers in the construction industry, may be secured gratis direct from the Wickwire Spencer Steel Co., by mentioning this magazine.

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Soils Study Feature Of Asphalt Meeting

One of the major themes of the Eleventh National Asphalt Paving Conference to be held in Memphis, Tenn., the week of December 6 and which is sponsored by the Asphalt Institute and the Association of Asphalt Paving Technologists, will be soils studies as they affect subgrade stabilization and soil erosion control. Other subjects to be discussed are highway economics, asphalt highways, asphalt for airport surfaces, river and harbor protection and county highway sidewalks.

Thomas H. MacDonald, Chief of the U.S. Bureau of Public Roads, will outline the Federal Government's highway program with special emphasis on the latest results of soil stabilization experiments. E. F. Kelley, Chief of the Bureau of Tests of the U.S. Bureau of Public Roads, State Engineer A. C. Tilley of Nebraska, F. V. Reagel, Materials and Tests Engineer of Missouri, L. L. Allen, Maintenance Engineer of Minnesota, and W. K. Beckham, Maintenance Engineer of South Carolina, will also speak on various aspects of stabilization practices, with C. W. Brown, Chief Engineer of the Missouri State Highway Department presiding.

The session on asphalt highways will be presided over by W. Vance Baise, State Highway Engineer of North Carolina, with W. H. Wood, Testing Engineer of the Texas Highway Department, J. W. Powers, Testing Engineer of Arizona, V. B. Steinbaugh of the Michigan Highway Department, and George H. Delano, of the Massachusetts Department of Public Works, presenting discussions of various types of asphalt surfaces for roads.

The design and methods of laying asphalt surfaces at airports will be outlined by one of the Federal airport surfacing engineers and the use of asphalt in river and harbor protection will be discussed by an officer of the U.S. Engineer Department.

Advance indications are that more than 700 highway officials, engineers and asphalt technicians will participate in the seven sessions of the Conference.

New Heavy-Duty Snow Plow

Improvements in its hydraulic-operated snow plows have just been announced by the Willett Mfg. Corp., Plymouth, Ind. Features of this plow are its reinforced construction designed to resist strain, bulkhead construction and angle reinforcement to hold the plow in shape when plowing heavy drifts and rutted snow, and the exceptionally high-lift of the wing, the front and rear ends of which are separately and independently controlled.

The accompanying illustration shows the latest improved model of the Willett hydraulic-operated snow plow and wing designed for use on 5 to 10-ton trucks. Complete details on these plows may be secured direct from the manufacturer.

Allis-Chalmers Expands

The Tractor Division of the Allis-Chalmers Mfg. Co., of Milwaukee, Wis., has announced an expansion program costing approximately $4,000,000. This program consists of additional buildings and equipment at the West Allis Works for tractor production, buildings and equipment at the LaCrosse implement plant, and additional equipment at the Springfield and La Porte plants.

These new facilities will give the Allis-Chalmers Mfg. Co. a greater production capacity than it has had in the past.

NEW 2" & 3" ALUMINUM PUMPS

Model 2-Fig. 22

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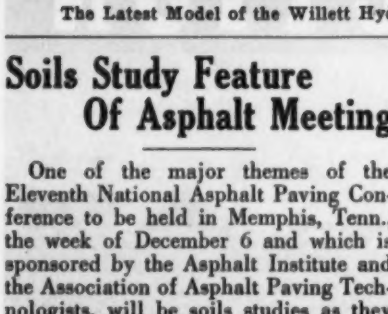

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Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price
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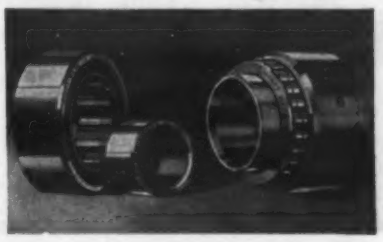

Concrete Paving In Tennessee

(Continued from page 12)

for their loads. The bridges each had two dumping holes for the two batches of the trucks. No canvas chutes were used from the dumping holes to the batches, resulting in some loss of cement from the batches as the carts were dumped. These carts were not equipped with the stirring device used on later models which delivers the cement in a more uniform flow. Consequently the use of a shovel was necessary and when too much vigor was employed the cement flowed a little too fast.

An old Caterpillar Thirty was used for moving the cement cars and also the aggregate cars along the track between the visits of the switching engine. After the trucks pulled out from under the loading bridge, the batches with the cement on top were covered immediately with a length of tarpaulin held fast by a piece of 2 x 4 or lighter stick at the back.

The batch trucks were all hired locally and consisted of a maximum of fourteen for the longest hauls. They were mostly Fords and Chevrolets.

The "Money Mud"

Perhaps the concrete in the good old days was more of a mud than real concrete but it is still referred to by many an old timer as "mud" and since it is the concrete in the slab that pays the contractor's bills he not infrequently refers to it as the "money mud". In this case the "mud" was well mixed for one minute by a Rex 27-E paver with a well-wishing skip man who wielded a mighty shovel to insure the delivery of every last grain of sand and speck of cement from the batch to the skip. The paver pushed a Carr subgrade cutter with diagonal blades to insure the deeper cut in the middle of the 20-foot slab and it also pulled a Carr trail-grader for the final touching up. Two men attended to the shoveling out of the excess dirt at each subgrade planer.

Right behind the subgrade planer the steel man set the center dowels across the center plane of weakness later to be cut. He used a simple but effective device for insuring the proper placing of the ½-inch diameter deformed rods 2 feet long. It was merely a 2 x 2 with a short piece of plank at either end which set itself up on the grade easily and spaced off the rods without any guesswork. The spacing incidentally was 30 inches, and the rods were held in place by sheet metal chairs with stop gages which automatically set the rods at the required 3 inches from the bottom of the concrete.

The expansion joints were set every 90 feet and the dummy joints every 30 feet. The steel in the dummy joints consists of twenty 2-foot ¾-inch round bars set with a frame which was not released until the frame was completely filled with concrete. Two men handled the making up and setting of the

C. & E. M. Photo

Shaking Down the Concrete at a Dummy Joint

expansion joints and dummy joint steel. A Master vibrator set on the Ord double-screed finishing machine and with a long flexible shaft was used to vibrate both sides of expansion joints, and dummy joints before the rack was released, and along the sides of the forms with excellent results, as shown by the absence of honeycomb on the edges of the slab exposed during the pulling of the forms.

Two puddlers preceded the finishing machine, doing away with the second pair needed when cutting along the forms is required. The vibrator man took their place. Back of the Ord was a Cleft Plane machine setting the 3-inch ribbon in the cut made 3½ inches deep by the wheel on the machine. The ribbon was fed in with remarkable uniformity and the top floated by the operator.

Finishing

The finishing of the pavement was done with remarkable dispatch and "with the greatest of ease." The finishers seemed always to be busy but without that haste that is so evident on some jobs. They had plenty to do as the contractor used two longitudinal floats, both Cleveland 12-foot by 8-inch channel steel floats worked from 4-wheel bridges, one float following close behind the center joint machine and the other float just ahead of the initial set of the concrete. Between the longitudinal floats the finishers checked the pavement with 10-foot aluminum straightedges and behind the second bull-float they dragged a narrow belt to remove any laitance. These same two men set the steel in the pavement after cutting the transverse slots for the dummy joints. Two 10-foot lengths of 2-inch by

(Continued on page 34)

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In every state get the FULTON LINE. Ask for SHURDRY and FULTEX Tents, Tarpaulins and Windbreaks—anything made of canvas. Also Road Mats and burlap. You buy quality products at fair prices when you buy the Fulton Line.
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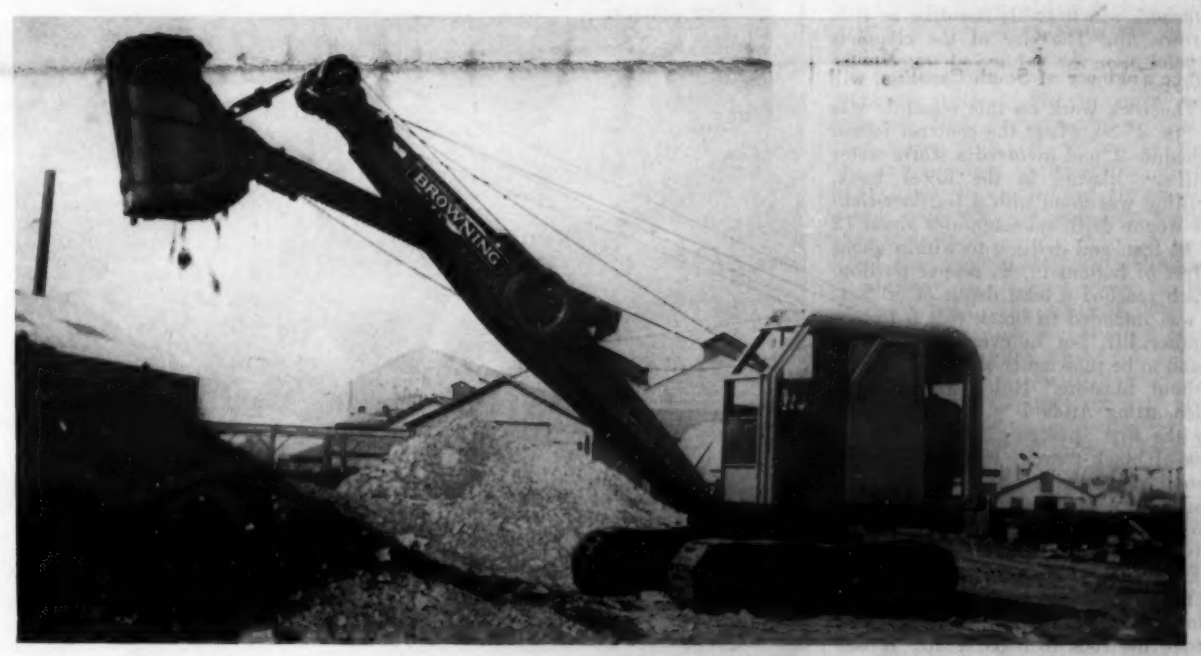

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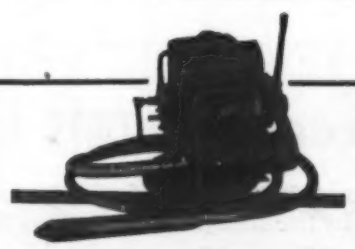


Concrete VIBRATORS
AND GRINDERS
Write for Circular on types, sizes and prices
White Mfg. Co.
ELKHART INDIANA

Gila Project

(Continued from page 16)

growth of ironwood, palo verde and giant sahuaro cacti. These were cleared off partly by hand, but mostly by pushing them out with bulldozers on Caterpillar diesel tractors, which also leveled steep banks ahead of the dragline.

The channel was roughed out by a Monighan 3-T dragline, which had been overhauled to increase the horsepower, and was equipped with a light oversized bucket. The machine worked from a position just inside the cut stakes on the right side of the canal, casting most of the spoil on that side, where a 30-foot roadway is being made. Fuel oil was hauled to the machine by a Caterpillar Seventy-Five, drawing an Athey crawler wagon, usually loaded with sixty 50-gallon barrels. The tractor also leveled the bottom and berms. The side slopes were finished with a 3-yard Northwest shovel with a steel drag swung beneath the bucket. Hard spots in the slope were trimmed with the drag, by setting the bucket down on it, to give added weight.

The only wash overchute on the 17 miles of canal will be built on Schedule 1, the wash involved draining an area of 9.65 square miles. Washes are numerous, particularly on Schedule 4 of the canal, but are short, due to the fact that the channel follows closely the foot of the Laguna Mountains. Groups of them are being combined by excavating a drainage channel a short distance above the canal and taking them into the latter through paved inlets of concrete and rubble construction. The channels are dug with the Northwest shovel, accompanied by a Caterpillar, with bulldozer attached, which levels the dike as it is thrown up. The size of the channels depend upon the volume of water to be diverted.

The rock work on this schedule was at Sta. 85-30, where the contract joined Schedule 2, and involved a storm water spillway blasted in the lower bank. Drilling was done with a Gardner-Denver wagon drill, spacing holes about 12 to 14 feet, and drilling to within about 6 feet of bottom in the deeper portion, which reached a total depth of 30 feet. It was intended to break this 6 feet in another lift, but in excavating it was found to be sufficiently shattered to load without blasting. Holes were sprung twice, using Atlas 1 x 8 gelatin stick, for the first springing. Up to a half-case of black powder was used for the second chambering. Holes were then loaded with four to six cases of Atlas Flo-Dyn. One of the larger shots involved 5 tons of explosive.

Excavation of the blasted material was let to Mittry Brothers, of Visalia, Calif., who had the adjoining Schedule 2, and needed the rock to make a fill. It was loaded with a Koehring combination shovel and hauled in International 8-yard dump trucks. Blasted rock from the spillway, about 8,000 cubic yards, was moved with a Hutchins bulldozer on a 75-hp Caterpillar and a LeTourneau bulldozer on an RD7.

Schedules 2 and 3

Rock Schedules 2 and 3 were contracted by Mittry Brothers for a total of $681,500. They include two tunnels and 3,600 feet of open canal lying between them. The canal section includes a rock cut 600 feet long, with a maximum depth of 75 feet, near the west portal of Tunnel 1. The first of three lifts in excavating this rock cut was drilled with Ingersoll-Rand jackhammers. The remainder of the main section was drilled with two Ingersoll-Rand Leyner drills, mounted on the rear of 30-hp Caterpillar tractors, with the jackhammers used in drilling the slopes. Holes were usually spaced 15 feet, and in the main section were about 26 feet deep. As many as 150 holes were fired at a time, after springing with du Pont 40 per cent gelatin stick and loading with black powder in the main section and bag powder near the slopes. The same drilling equipment was used in both tunnel portals, as well as in the rock cut. A flood water spillway was excavated in the lower bank of the cut. Rock was loaded with a Koehring combination shovel into International 8-yard dump trucks, and used to make an adjacent fill.

Tunnel Construction

Tunnel No. 1, 1,740 feet long, which has been dug, was through comparatively shallow overburden, and marked throughout by strata of unstable ground. This caused some trouble in getting under ground at the west portal. The arch section had to be driven ahead a few feet and wall plates and segments installed for 6-foot sets. The main section of the tunnel was blasted from the center until 12 x 12 posts could be installed under the wall plates, which were the same size. Lagging 3 x 12-inch was used, backed up in places with miscellaneous timbers. All underground drilling was done with six Ingersoll-Rand N-74 drifters, mounted on a jumbo made of pipe. About fifty holes, 6 to 12 feet deep, were drilled to a round, the depth varying according to the stability of the rock.

Loaded Cars on the Way Out from the East Portal of Tunnel No. 2 on the Mittry Contract

The outside ring of shots was delayed, those at the arch being fired last, to avoid shattering. In driving No. 1 special care had to be used in barring down

(Continued on page 36)

90% OF YOUR TRACTOR WORK IS DONE AT THE HIGHER SPEEDS . . . BUY TRACTORS THAT *Excel* ON THIS 90%

Allis-Chalmers tractors are designed to deliver maximum performance at the higher working speeds. These are the speeds at which you do 90% of your tractor work on the average construction job. Buy tractors for this 90% of your work ... not for the other 10%.

ABOVE—Building spur line for railroad near Canton, Ill. In the foreground are two Model "S-O" Oil Tractors pulling Continental Scrapers on tracks. *BELOW*—Model "S-O" Tractors and 7-yard Continental Scrapers on road building jobs in Illinois and Wisconsin.

Diesel-Powered Compressor

A new bulletin, No. 762, describing Chicago Pneumatic diesel-engine-driven compressors in both portable and stationary types has just been issued by the Chicago Pneumatic Tool Co., 6 East 44th St., New York City.

The Class WO-2 portable compressor, with an actual capacity of 700 cfm, consists of a C-P Type 48 vertical 4-cylinder 4-cycle medium-speed diesel engine on a common crankcase and crankshaft with a V-type two-stage double acting water-cooled compressor, with suitable cooling systems and air receiver, all on a structural steel deck, arranged for mounting on skids or on wheels, forming a self-contained portable unit.

One of the New C-P Class WO-2 Portable Compressors

The Class W-CO stationary compressor uses the same engine and compressor as the Class WO-2 portable but is arranged for mounting on a permanent foundation or on skids.

Copies of this Bulletin No. 762, containing complete descriptions and illustrations of these new diesel-powered compressor units, may be secured direct from the manufacturer by mentioning this magazine.

Concrete Form Devices

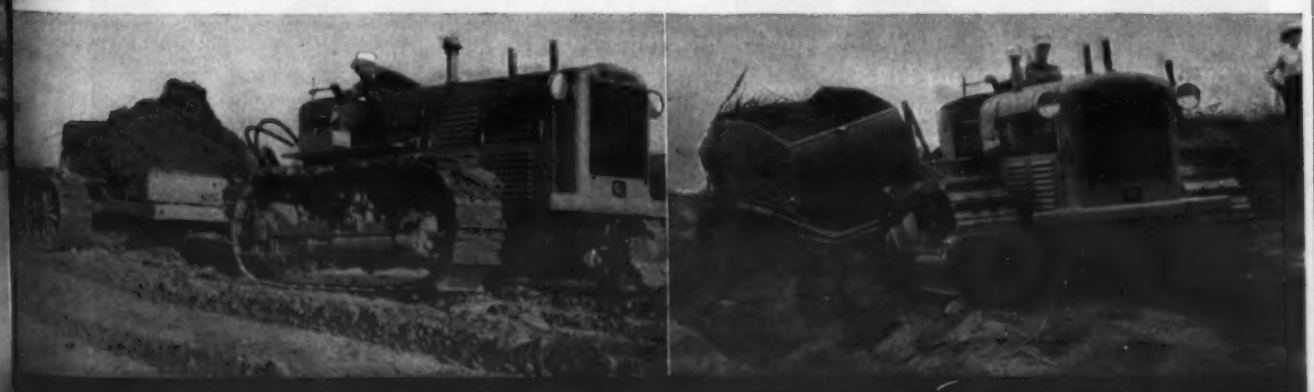
Various concrete form devices, including Fischer form clamps, spacer-ties for wall forms, clamps for wall forms and columns, Z spacers, clips, and similar accessories for concrete forms are described and illustrated in a new bulletin recently issued by the Fischer & Hayes Rope & Steel Co., 842-844 W. Erie St., Chicago, Ill.

Copies of this bulletin may be secured by interested contractors direct from the company at the above address.

"—haul more loads per day

The seconds you save shifting gears with an Allis-Chalmers Model "S-O" ... count up into minutes in the course of a day. These minutes mean more trips, more yardage, more profit for the Allis-Chalmers owner. With the "S-O", it is not necessary to come to a complete stop to shift gears. You shift "on the go"—like a motor truck. Only the Allis-Chalmers Model "S-O" has this time-saving feature ... a Constant Mesh Transmission with gears always in mesh. Only the Model "S-O" in its power class (64 drawbar H.P.) has 5 speeds forward—up to 6.37 miles per hour. In its size and price class, only the "S-O" has that famous Allis-Chalmers BALANCE ... which means quicker pick-up, higher working speeds, better hill-climbing, greater economy, less maintenance and superior all-'round performance. Only the "S-O" is built to BEAT the job—not stretched to meet it. Put the "S-O" to work on your job! It's the MODERN tractor for modern requirements. Ask the A-C Dealer!

TRACTOR WEIGHT SAVED MEANS EXTRA PAYLOAD GAINED



ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition OIL TRACTORS
Timed Right to Fire at the Right Time

N. D. Snow Fighting Includes Snow Fence

(Continued from page 13)

cause of the lack of front-wheel-drive to hold the plow against snow banks; but our fears were groundless, as the tandem drive seems to offset the lack of front-wheel-drive.

We do not use dual tires in snow removal work but remove the dual equipment, allowing the single tire to cut through to solid footing, thus gaining much more traction.

The equipment listed above works out of eight division headquarters located at Bismarck, Valley City, Devil's Lake, Minot, Dickinson, Grand Forks, Williston and Fargo. At each of these points, the State Highway Department maintains well-equipped shops for servicing, repairs and storage. Each unit has assigned to it two crews with alternates and operates 24 hours a day, except for time out for servicing and repairs.

All equipment is kept in first class condition at all times and is equipped in the best manner possible with lights, heaters, fire extinguishers, additional fuel capacity and other miscellaneous accessories needed in the grueling work of snow removal.

Snow Fence

We protect approximately 575 miles of highway by snow fence, of which 93 per cent is of the slat panel type with steel posts set from 100 to 150 feet beyond the backslope on the side of the prevailing wind, which is the northwest. Some stretches, of course, are protected on both sides. This fence is erected in October and taken down each spring, rolled and placed on rock or steel post cribbing along the right-of-way.

In erecting the fence we use a 1½-ton truck with a five to seven-man crew unrolling, stretching, bracing and tying. The posts are driven by section men previous to the arrival of the snow fence crew. In the spring the section man with the aid of a helper takes it down.

We also protect long level stretches of highway by ridging snow in the adjoining field. This work is done by motor graders and in some instances by trucks with push plows. The first ridge is thrown up approximately 100 feet from the backslope; the successive ridges beyond are approximately 50 feet apart until from three to five are formed. These are effective early in the season. We also do other work of the drift prevention type, such as cleaning weeds from ditches and fences and mowing high grass on the backslopes and beyond the fences to prevent drifts from forming.

Finney Joins Riddell

G. D. Finney, who has been associated with the Rome Grader & Machinery Corp. for a number of years as Sales Manager, has become Sales Manager of the Road Machinery Department of the W. A. Riddell Corp., manufacturer of Warco drawn and power graders.

Snow-Plowing Suggestion

One matter which should be given careful attention in the matter of snow removal is that wherever possible the snow should be plowed completely off the shoulders and in to the ditches. This should be done for two reasons: the first is that it makes room for the snows that follow and the second is that when the snow melts, the water is where it belongs rather than lying along the edges of the pavement and on the shoulder where it will do considerable damage.

From the Report of the Committee on County Maintenance to the American Road Builders' Association, January, 1937.

The Improved Rapid Pavement Breaker Mounted on a 1½-Ton Truck

An Improved Model Of Pavement Breaker

An improved rapid pavement breaker which is claimed to be much faster in operation and transit than previous models has just been announced by the Concrete Cutting Corp. of America, 605 Degraw St., Brooklyn, N. Y. The unit consists of a Schramm air compressor and piston-type pneumatic breaker mounted on a 1½-ton truck.

The breaker is designed to cut widths from 6 inches to 12 feet in one operation, striking a controlled blow of 15,000 foot-pounds 100 times a minute. It will break up concrete, asphalt, macadam, frozen ground and reinforced concrete. The manufacturer claims that it will easily handle depths of 9 inches in concrete pavement and in bridge work will break out decks 4 feet thick.

Complete information on the pavement breaker may be secured direct from the manufacturer by mentioning this magazine.

Alternating Current Electric Lighting Plants

Portable and semi-portable alternating-current electric light plants from 300 to 10,000-watt capacity, made either self-cranking or equipped with a 6-volt starting motor, are produced by Kato Engineering Co., Mankato, Minn. Kato plants of 2,000 watts and less can be started with gasoline and then operated with kerosene. These particular plants are equipped with a 2-compartment fuel tank and all of the plants are equipped with a fuel supply tank with a capacity for several hours operation and a vacuum tank for drawing fuel from a larger supply tank.

These unit plants are mounted on vibration-absorbing, sponge-rubber bolsters and have a unique coupling between the engine and generator, providing steady lights without any disturbing flicker. Full information regarding these plants will be found in Bulletin 3137 issued by Kato Engineering Co.

Louisville Dealer Moves

Thomas L. Barret, distributor of contractors' equipment and supplies in Louisville, Ky., has moved from 112-114 South Second Street to new and better-equipped quarters at 712 West Main Street.

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including bridge deck slabs, dams and locks.

Portable Vibrating Screed Boards for highway pavements.

Special steam operated vibrators for placing hot asphalt mixtures.

Write for circulars and engineering data

RENTALS SALES

MUNSELL CONCRETE VIBRATORS

997 West Side Ave. Jersey City, N. J.

Picks and Shovels

(Continued from page 1)

1,400 feet long and 80 feet high, was designed to form a lake 333 acres in area for a public recreation project. Two weeks before its dedication was supposed to come off, the whole center section collapsed while cave-ins reduced the rest of the dam to just mounds.

"There will be hearings, borings, discussions and arguments; somebody's face is going to get very red if the truth about the engineering becomes known. But just why make a stir? Here was a million dollars distributed over a period of nearly two years to a large number of workers. Completion of the dam would have put them out of a job; the collapse is a happy solution of a difficulty, for now they can go back to work building a new dam, and if that will only collapse at the proper time, there will be lots of work for Wyandotte County, Kansas. Isn't that what WPA is for?"

International Harvester Moves to New Building

The general offices of the International Harvester Co. were moved last month to the new Harvester Building at 180 North Michigan Avenue, Chicago. This new location at the southwest corner of Michigan Avenue and Lake Street is just nine blocks north of the old Harvester Building which the company has occupied since 1907.

Portable Compressor Booklet

A new well-illustrated booklet on Sullivan portable compressors and their applications in the construction industry has just been issued by the Sullivan Machinery Co., Michigan City, Ind. Details of the design and construction of these compressors, which are available in a variety of sizes and mountings, with gasoline or diesel power, are given, as well as a complete list of Sullivan distributors and service stations throughout the country.

Copies of this Bulletin A-20 may be secured direct from the manufacturer by mentioning this magazine.

Hobart 40 Volt Simplified Arc Welder will save hundreds of dollars monthly by repairing your own equipment, building forms and on steel construction work. Write today for these free books—☐ Easier and More Profitable Arc Welding. ☐ Carbon Arc Welding and Cutting. ☐ Building Your Own Arc Welder Saving $200 to $500. ☐ Many Profitable Uses of Simplified Arc Welding.

HOBART BROS., Box CE-117, TROY, OHIO

ENGINEERING NEWS-RECORD 101

July 15, 1937

New Record in Pouring Concrete

Recent progress at Grand Coulee Dam completes preliminary work and prepares for concrete placing schedule of 440,000 cu. yd. per month

BOUT HALF of the concr[ete] yard- [80,000] cu. yd. of the [con]crete in the [to]n[s] concrete in the present [4,500] [cu. yd.] [per] [day] with [a] [maximum] [day's] [pour] [of] [10,000] [cu. yd.]

Eight modern Koehring 112-S one-opening, tilting mixers are producing concrete night and day at Grand Coulee to help establish the remarkable records being made. Koehring concrete mixers are designed to give maximum production and mix high quality concrete in accordance with the most advanced specification requirements.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Water Supply Dam For Little Rock

(Continued from page 15)

Rock, Ark. Included with this was the intake tower and the caretaker's house on the hill above the spillway and dam. The batches for the concrete were weighed out in a Heltzel portable batcher which was loaded by a Bucyrus-Erie steam crane. Two General Motors batch trucks shuttled the batches to the Koehring 27-E paver that mixed the materials on the spillway. For the first section of guard walls Peterson used a Barber-Green conveyor for placing the concrete at the right elevation for the forms. Later a Pumpcrete was installed and handled the concrete for all the work, permitting continuous operation through the constant feeding to the loading hopper and the ease with which the pipe line can be unlimbered. The Pumpcrete was the new small size driven by a Waukesha engine. For the spillway pavement the sections were divided into 35-foot squares and poured from the bottom up with a fairly dry concrete, screeded by hand and cured by placing burlap over the slab and sprinkling for the required period. This paving was on a 25 per cent grade. Peterson worked one 8-hour shift a day and maintained good progress because of the continuous operation of the Pumpcrete.

Camp and Water Supply

The contractor's camp, located about ½ mile from the dam site, consisted of two bunk houses for fifty men each, the two street car bunk houses, twenty-four tents for labor with families, six houses for executives and the commissary where very good meals were served on a cash or meal ticket basis for all employed on the job, either by the contractor or the engineers. A 5-kw Kohler electric plant furnished the lighting facilities for the entire camp and a separate unit for the contractors' and engineers' offices at the dam site.

The camp water supply consisted of a 2-inch driven well with a 750-gallon elevated supply tank permitting gravity supply to the houses below during off-pumping periods. The well was originally driven 60 feet and furnished an excellent supply, but when the tunnel for the supply line from the reservoir to the city was holed through the supply for the well diminished to the vanishing point. The well was then driven 200 feet deep before a satisfactory quantity was secured.

Personnel

The Alum Fork dam and spillway contract was awarded to L. O. Brayton & Co., of Dyersburg, Tenn., on its bid of $921,726.05. The work was in charge of Alvin G. Hall, as Superintendent, with H. L. Clough as Contractor's Engineer. The entire project was designed and construction supervised by Burns & McDonnell Engineering Co., of Kansas City, Mo., for the City of Little Rock, Ark., with M. L. Crist as Resident Engineer and E. J. Thomson and E. A. Elliott assisting on engineering and soil studies.

Snow Plow 1938 Handbook

The Sargent Handbook of 1938 recently issued by Maine Steel, Inc., South Portland, Maine, contains 86 pages of valuable information on Sargent snow-fighting equipment, which includes a complete line of snow plows, with three types of hook-ups, three types of wing mounts and three types of hydraulic controls.

The V-type and rigid-one-way Sargent plows are both designed for deep snow work and with the Sargent wings are suitable for use in the heavy-snow country on unsurfaced or on surfaced roads. The trip-one-way and reversible-blade models are more suitable to patrol and clean-up work and for use nearer or in communities where obstacles, such as manholes, are frequent. For the front plows there is a hand hydraulic, a body pump power hydraulic and Types A and B power hydraulic controls and for the wings a chain hoist and Types A and B power hydraulic controls, designed to meet every snow-plowing condition.

Copies of this well-illustrated Handbook may be secured gratis by state, county and township highway engineers direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Law of Averages—Drive without looking and it is an average of three days until the funeral. —*Link-Belt News.*

Linde Air Products Moves Boston Office

The Linde Air Products Co., unit of the Union Carbide & Carbon Corp., of New York City, has announced that its Boston office has moved to 441 Stuart Street.

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WILL DRY UP ANY EXCAVATION
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Specify STERLING and be assured of successful performance by these THOROUGHLY TRIED and PROVEN PUMPS.
Write Today for Literature and Prices
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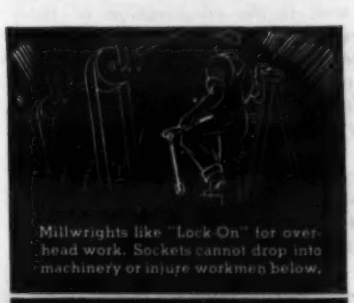
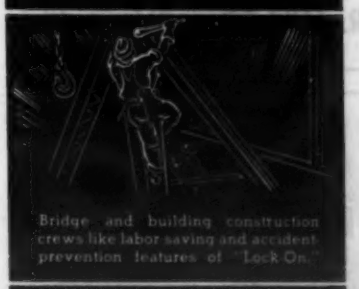
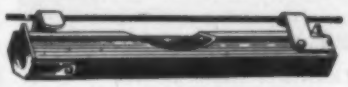
LOCK-ON SOCKETS ARE SAFE
THEY Can't DROP OFF

For "LOCK-ON" slip socket on square drive—hole in line with plunger. For friction grip, do not line up hole and plunger.
HEAVY AND EXTRA HEAVY DUTY SOCKETS IN WIDE RANGE OF SIZES
BOTH DOUBLE HEX AND DOUBLE SQUARE
BLACKHAWK "LOCK-ON" sockets are "clicking" in many lines of industry—making a big hit with millwrights, bridge and building construction crews; in shops and factories and on speed production lines. A "Lock-On" socket is securely locked on handle or extension in a jiffy. Can't drop into machinery, gear boxes — or injure workmen working from below. Stays on until worker wants it off — then exclusive Thumb-Release permits removing socket instantly. "Lock-On" sockets speed results, save time, prevent accidents, help turn out more and better work—no matter how difficult the position or how close the quarters.
• • •
Ask BLACKHAWK about "Lock-On" Sockets and Wrenches — also Box Type and Open End Wrenches in the complete line of famous Blackhawk Wrenches.
BLACKHAWK MFG. COMPANY
Dept. CM-11 MILWAUKEE, WISCONSIN
Exclusive Canadian Distributors:
THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
Branches in All Principal Cities
BLACKHAWK Socket Wrenches
"LOCK-ON" is a patented and exclusive feature of Blackhawk Socket Wrenches. "Lock-On" clicks sockets, handles and extensions into one solid tool — is recognized by engineers and contractors as a great time saver as well as an important safety factor. The illustrations below show only a few of the many ways "Lock-On" proves its worth in industry » » »

Millwrights like "Lock On" for overhead work. Sockets cannot drop into machinery or injure workmen below.

With "Lock On" sockets cannot come off to drop into gear boxes or machinery housings.

Bridge and building construction crews like labor saving and accident prevention features of "Lock On."

There's nothing better than "Lock On" for high production nut setting. More nuts per socket mean low cost.

SAND'S-STEVENS Line & Surface LEVEL

Endorsed and adopted by Road Builders and Contractors
Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.
SAND'S LEVEL & TOOL CO.
8631 Gratiot Ave. Detroit, Mich.

Work on New U.S.B.P.R. Research Station Begun

Plans for the new Research Station of the Bureau of Public Roads at Abingdon, Va., have been completed and work has already begun. The buildings and the outdoor testing facilities which will be provided by the completion of this project will give to the Bureau adequately equipped and housed laboratories and a considerable area for outdoor tests on a permanent location to carry on the work which in the past has been done at the Arlington Experiment Station.

The new site at Abingdon consists of 54 acres along the Potomac River on the George Washington Memorial Highway and is 2 miles from the bridge across the Potomac from Washington. The buildings now under construction will house the Division of Tests. They are of colonial design in keeping with the Memorial Highway on which they are located. The left wing of the group will house bituminous and subgrade soil research. The right wing will be used for structural tests, concrete and other investigations. A two-story bay in each of these wings will be available for high testing equipment such as may be used in impact studies and in bridge tests.

The center building will be used for the machine and carpenter shops and as a garage. A small building at the right will contain the central heating plant.

A New Four-Wheel-Drive Highway Maintenance Truck

Model HG, the newest in the line of FWD four-wheel-drive trucks, which was recently announced by the Four Wheel Drive Auto Co., of Clintonville, Wis., is designed especially to meet the conditions of highway maintenance work.

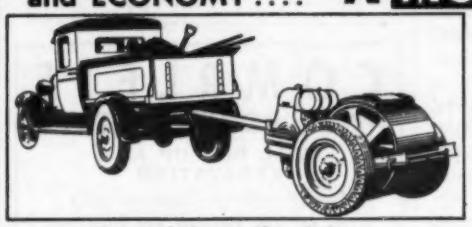
Among the features of this new maintainer unit is the construction of the patented FWD transfer case which has been so built that a clearance of 23 inches under the driving mechanism permits the installation of an underbody scraper or other maintenance equipment. The unit has a rated capacity of 2 tons and a gross rating of 16,000 pounds. The wheelbase is 156 inches. With a bore and stroke of 4⅛ x 4¼ inches and a piston displacement of 381 cubic inches, the 6-cylinder FWD motor develops 85 hp at 2,500 rpm.

The brakes include a four-wheel hydraulic set, operated by a vacuum booster, and a parking set of the external contracting type, operating on the transmission, with braking action on all four wheels. The tires are 7.50 x 20 inches, with singles mounted on the front wheels and duals on the rear.

Complete information on this new highway maintenance unit may be secured by state, county and township highway departments as well as by interested contractors direct from the manufacturer by mentioning this magazine.

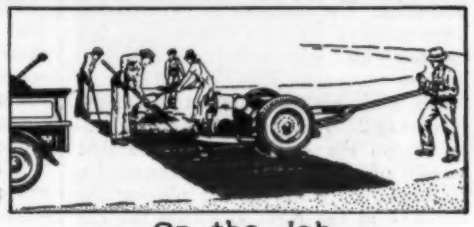
Setting an example is better than passing a law. This certainly applies to safety.

FOR SPEED and ECONOMY.... A MOTORIZED WHEELED ROLLER



To and from the Job a High-speed Trailer

MODEL 135
COMPRESSION 135 LBS. PER INCH OF CONTACT
The most economical and efficient Roller for all types of patch work and miscellaneous small jobs
Write for DETAILS!



On the Job a Self Propelled Roller

The WHEELED ROLLER Corp. ★ SAN ANTONIO, TEXAS

A Trailer for Every Heavy Duty Requirement

ALL TYPES
ANY CAPACITY

Write or Wire
C. R. JAHN CO., Chicago, Ill.
Builders Bldg.

Beyond THE GRASP OF WINTER'S ICY FINGERS

● Cold-weather concreting is not only practicable, it's actually easy—when calcium chloride is included in the mix. By accelerating the setting and hardening of concrete—producing high early strength—the use of calcium chloride greatly shortens the time required for protection against freezing, enables earlier removal of forms, and permits quicker, easier finishing.

This is not theory—it is an indisputable fact, proven on thousands of governmental and private projects, and verified by research studies of the National Bureau of Standards, Highway Research Board, American Society for Testing Materials, and other recognized authorities.

State after State is writing the use of calcium chloride into their specifications. Contractors who have used it once wouldn't place concrete without it in cold weather—and often in weather that's not so cold, since time is almost always a factor.

Write For Literature

Calcium chloride costs little, pays for its use many times over. Let us tell you how it can help in any concreting projects you undertake during the cold weather months. A postcard to any of our member companies will bring you full details on the *simple* specifications and methods for calcium chloride use in concrete.

CALCIUM CHLORIDE ASSOCIATION

The Columbia Alkali Corporation	Barberton, Ohio
The Dow Chemical Company	Midland, Michigan
Michigan Alkali Company	60 E. 42nd St., New York City
Solvay Sales Corporation	40 Rector St., New York City

Late fall construction on a Minnesota bridge project.

Same bridge in December. Cold weather work accomplished by use of calcium chloride admixture.

Coagulating basin at Lawrence, Massachusetts, constructed during the winter of 1936.

CALCIUM CHLORIDE
YEAR 'ROUND CONCRETE CONSTRUCTION

Build Your Own Portable Welder

The new Hobart 40-volt simplified welding unit, made by Hobart Bros., Box CE-97, Troy, Ohio, which is designed to give contractors, state and county highway shops and others an opportunity to build their own portable welding outfits to suit their particular problems and needs, consists of a welding generator, exciter, reactance, controls, terminals and flexible coupling, all built into a single compact unit.

It is ready for connection to a gasoline engine or motor and can be mounted on a motor truck, four-wheel trailer or any other suitable unit for conveyance, according to the desires of the user. Complete instructions for installation as well as operation are furnished. The manufacturer reports that hundreds of these units have been sold to purchasers who made up their own portable units for use in their shops or out on the job.

Complete information on the welding unit and the "Build Your Own" plan may be secured by those interested direct from Hobart Bros.

Standards on Petroleum Products and Lubricants

The 1937 edition of the A. S. T. M. Standards on Petroleum Products and Lubricants, sponsored each year by Committee D-2 of the American Society for Testing Materials, includes in their latest form the fifty-eight test methods which have been standardized, seven specifications and two lists of definitions of terms relating to petroleum and to material for roads and pavements. The standards given in the publication pertain to a wide range of petroleum products.

Copies of this 390-page publication, in heavy paper cover, may be secured from the American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. Price: $2.00.

LeTourneau U-18 Carryalls working on Crick's contract in Yellowstone. Of 500,000 cubic yards in a 10-mi. stretch, 425,000 will be handled by LeTourneau Carryalls, Angledozers and a Rooter. (Below) — LeTourneau Angledozers breaking down the steep hillsides and drifting material into the ravines ahead of the Carryalls at Yellowstone.

CRICK BOOSTS HIS YARDAGE IN YELLOWSTONE . . .

ACTUAL JOB DATA

When James Crick put his LeTourneau fleet to work on the 10-mile realignment project between Old Faithful Inn and West Thumb in Yellowstone National Park, two U-18 Carryalls, pulled by "Caterpillar" RD8 tractors, went onto the job. Despite a power-robbing elevation of 8300 feet, these two U-18's, working with a booster tractor, in a 34-hour period moved 8100 cubic yards of material on a 2400-foot, figure "8" haul, an average of 119 cubic yards per scraper hour. That's boosting yardage, slapping down costs.

Ask your "Caterpillar" dealer how LeTourneau equipment can boost your yardages, and lower your costs.

* Job observed and data certified by our Field Engineering Department. You are invited to call on this Department for aid in estimating and planning the best methods of handling your earthmoving problems.

LETOURNEAU

R. G. LeTOURNEAU, Inc. » Peoria, Illinois » Stockton, California » Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Cranes, Carryall* Scrapers, Drag Scrapers, Power Control Units, Rooters*, Treedozers

*Name Registered U. S. Patent Office

The New Victor Welding and Cutting Outfit

New Welding, Cutting Unit

A light-weight combination cutting and welding unit for repair work or light welding jobs has recently been announced by the Victor Equipment Co., 844 Folsom St., San Francisco, Calif.

This No. SV-100 unit is comprised of a new standard Victor welding torch of slightly smaller size equipped with four nozzles, each of which is provided with an individual patented Spiral-Mixer. A No. 500 cutting attachment with tip instantly fits onto the welding torch head.

New type SVJ double-gage regulators of adequate capacity and pressure adequacy, together with oxygen and fuel gas hose, goggles, spark lighter and necessary wrench, are standard equipment with this unit. The welding range extends from very light sheet-metal to beyond ¼-inch of metal thickness and permits easy cutting of metal thickness up to 3 inches.

Complete information on this new unit may be secured direct from the manufacturer.

Unusual Bridge Erection Methods on Nisqually Job

(Continued from page 2)

area as a seal. The ends of the piles projecting up through this seal were then sawed off even and reinforcing steel laid on the tops of the pile heads, after which a 5-foot course of concrete was poured. After this had set, the forms were erected upon it for pouring the solid concrete pier slab proper.

Steel Erection

In erecting the steel structure, it was set on falsework beginning at one end. The steel was handled by means of a guy derrick mast 100 feet high with a 90-foot boom. The mast was guyed with six 1-inch steel cables, some of them up to 600 feet long. As the floor beams of the bridge progressed, the derrick was moved along over them, the derrick and donkey being mounted on skids. In moving it forward, the guy wires with a rearward pull were loosened and the forward ones tightened up with falls. When the position was attained, all guys were then cinched up with turnbuckles.

A. E. Mortenson, Superintendent, furnished the essential data on the bridge and the method of erection, as well as the accompanying photograph of the derrick in operation, which he took during the early stages of the work.

HEAT—when you need it

The Littleford Model "C" Pressure Distributor has just one burner. It is the Littleford Low Pressure oil burner.

This one burner generates a greater volume of heat than any two ordinary coil type burners. But this heat is absolutely safe because the temperature of the flame from this burner is no higher than that from a coil burner.

This vast volume of safe heat is carried to every part of the tank quicker and more evenly by the Continuous Heat Flue System. No hot spots. No burned out tubes. Faster heating of bitumen with complete safety.

And the same burner used to heat the tank of the Littleford Model "C" Distributor thaws out pump, valve and lines in less than 3 minutes. No extra burner needed.

Send in this Coupon

Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio. Send full particulars on why the Littleford Model "C" is the fastest heating distributor.

Name ..... Title .....

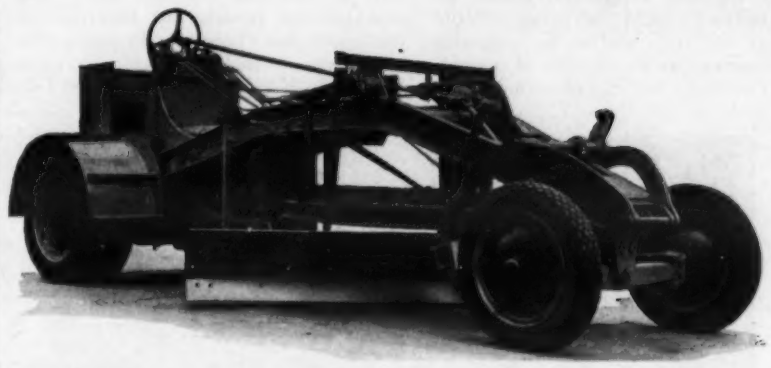
Address .....

City ..... State .....

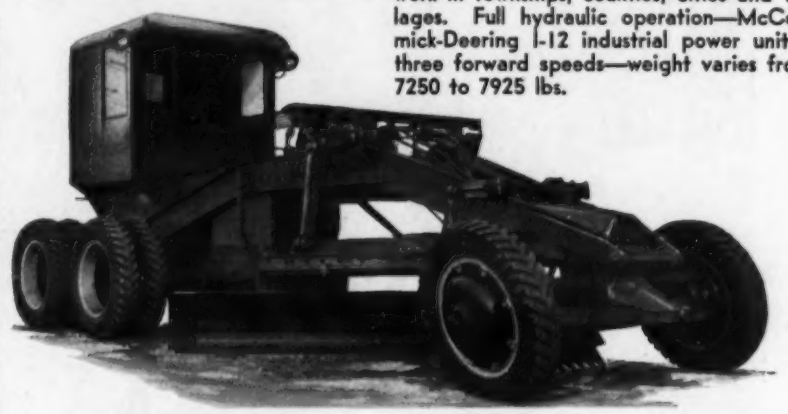
Mail Coupon Today

Littleford Bros.
485 E. Pearl Street
CINCINNATI, OHIO

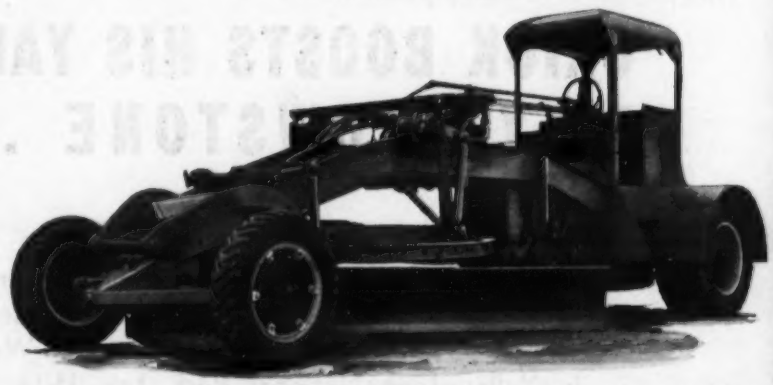
4 Smart MODELS



JUNIOR PATROL A light, inexpensive grader for maintenance work in townships, counties, cities and villages. Full hydraulic operation—McCormick-Deering I-12 industrial power unit—three forward speeds—weight varies from 7250 to 7925 lbs.

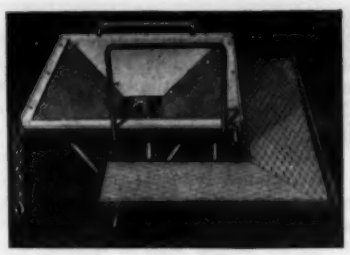


STANDARD A motor patrol grader to meet average requirements. McCormick-Deering I-30 power unit—hydraulic control—single or double drive—hydraulic differential control—weighs around 13,000 lbs. Dependable and economical.



HEAVY DUTY (2 Models) Gasoline powered (above) by Case LI or Oliver 44 industrial units; diesel powered (below) by International TD-40 full diesel engine. For tough grading jobs calling for stamina and power. Single drive with dual tires or double drive with four or eight tires.

The Galion Iron Works & Mfg. Co.



The Galion Highway Sander

Sanding Icy Roads To Make Them Safe

A new highway sander, for spreading sand, chips, cinders and calcium chloride on icy roads to render them safe for winter traffic, is made by the Galion Iron Works & Mfg. Co., Galion, Ohio. This device, which is claimed to do the job quickly and economically, is simple in construction, requiring neither a separate power unit nor a power take-off from the truck. Drive is by means of friction from a standard automotive wheel which engages the distributing disc and is held in contact by means of a spring tension.

The sander will spread material on the surface ahead of the rear wheels of the truck as well as its own wheel, thus providing safe and sure traction. The width of spread is governed by the truck speed and adjustment of the automotive wheel, in or out, on the disc. By adjusting the discharge gate on the truck, the flow of material into the hopper can be readily regulated. Both the disc and drive wheel are mounted on Timken taper roller bearings with Alemite High-Pressure lubrication.

Complete details on this sander, which can be easily attached to any type of dump-body truck, are contained in Bulletin No. 209, copies of which may be secured direct from the manufacturer.

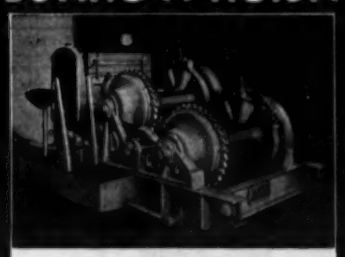
Quebec Has 5-Year Plan

One of the largest road-building programs ever launched in Canada was announced by the Deputy Minister of Roads of the Province of Quebec at the recent annual meeting of Canadian Good Roads Association.

This is a 5-year program, designed to transform the highway system of Quebec and includes the elimination of gravel on many of the trunk roads; the widening, straightening, and where necessary new location of the most heavily traveled highways; the elimination of traffic hazards such as sharp curves and railroad crossings; and laying of up-to-date and adequate pavements all over the province, with a view to connecting by good all-weather roads all rural communities.

The program for 1937 includes approximately 1,800 miles of construction, reconstruction, paving and asphalt carpeting, as follows: 690 miles of main highways to be constructed or reconstructed; 152 miles to be paved with bituminous or cement concrete, mainly bituminous; 550 miles of gravel road changed to bituminous carpet; 400 miles of secondary roads being permanently improved; 29 railroad level crossings being eliminated; and many local improvements.

BUYING A HOIST?



JAEGER Ball Bearing HOISTS up to 100 H.P. Offer . . .

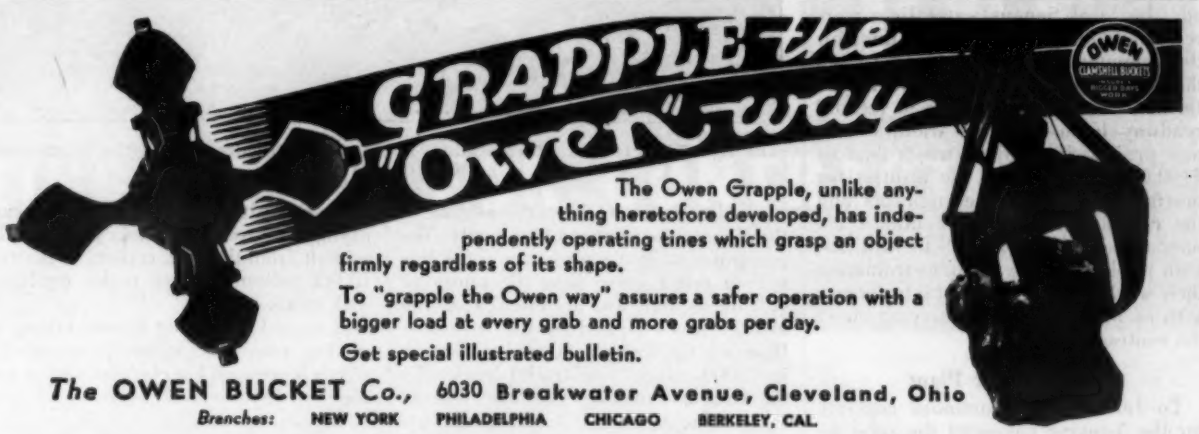
- Finger-Tip Hoist Control (same as on $12,000 Shovels)
- Finest Double-Row, Self-Aligning Bearings,
- Machined, Balanced Drums
- Silent Chain Drive, Compounding Brakes, etc. 1, 2 or 3 drums (interchangeable), Gas or Electric.

Get our low prices on light 10-20 H. P. and intermediate 25 H. P. Screw Thrust Hoists. Send for Catalog H-37.

THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio

JAEGER

GRAPPLE the "Owen" way

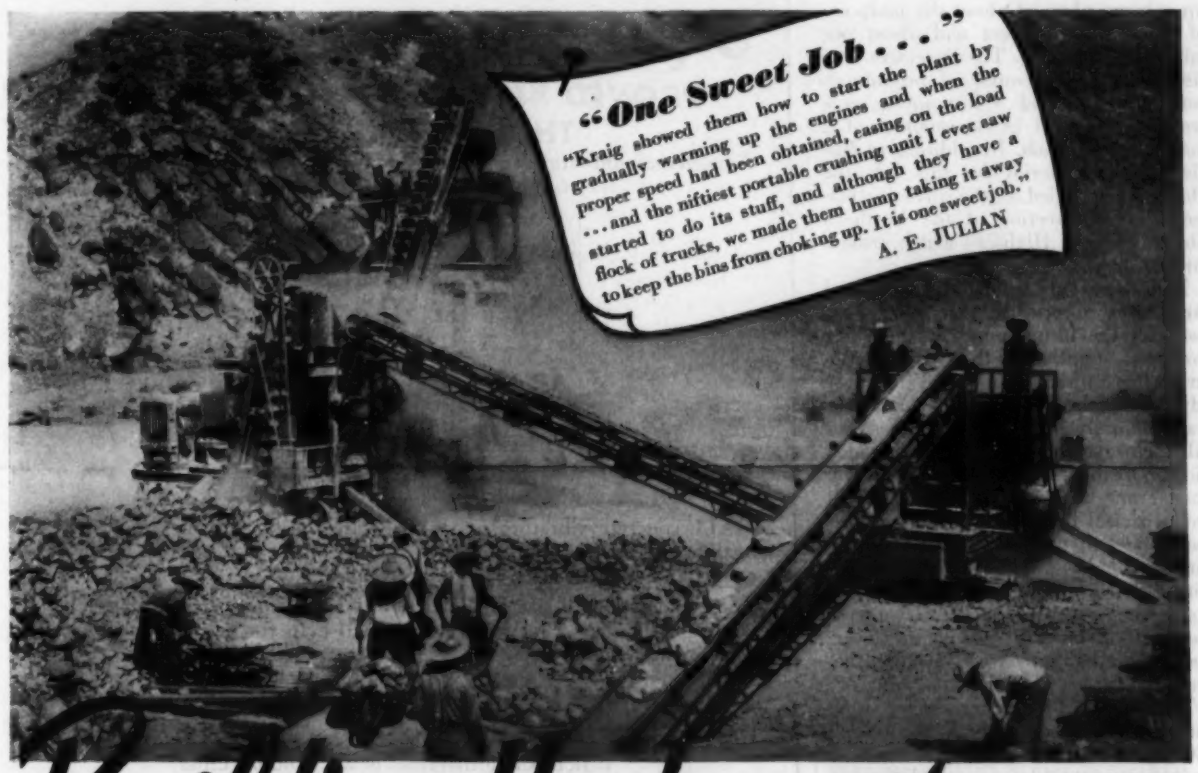


The Owen Grapple, unlike anything heretofore developed, has independently operating tines which grasp an object firmly regardless of its shape.

To "grapple the Owen way" assures a safer operation with a bigger load at every grab and more grabs per day.

Get special illustrated bulletin.

The OWEN BUCKET Co., 6030 Breakwater Avenue, Cleveland, Ohio
Branches: NEW YORK PHILADELPHIA CHICAGO BERKELEY, CAL.


"One Sweet Job . . ."
"Kraig showed them how to start the plant by gradually warming up the engines and when the proper speed had been obtained, easing on the load . . . and the niftiest portable crushing unit I ever saw started to do its stuff, and although they have a flock of trucks, we made them hump taking it away to keep the bins from choking up. It is one sweet job."
A. E. JULIAN

Building Highways IN MEXICO

Down in Coah, Mexico, the Constructora del Norte of Saltillo is working on the splendid new system of national highways. The engineer in charge, Juan Garcia Gonzalez, selected a Telsmith Portable Crushing Plant to process the aggregate.

This Telsmith super-crushing outfit is a two-crusher tandem portable plant, turning out 30 tons per hour to minus one inch size. It consists of a coarse crushing unit —24 in. x 42 ft. portable belt feed conveyor, No. 10-B Telsmith Primary Breaker with charging platform and V-belt drive, mounted on a truck.

The breaker unit discharges to a 24 in. x 42 ft. secondary conveyor which carries the aggregate to a No. 320 Telsmith fine crushing, screening and loading plant, operating in closed circuit. This unit is equipped with a 32-B Telsmith Reduction Crusher for large scale production of minus 1 in. aggregate; 18 ft. folding chain elevator; 3 x 10 ft. Telsmith single deck Pulsating Screen; all mounted on truck. A No. 4 chain elevator 34 ft. long conveys aggregate to a 20 cu. yd. 3-compartment all-steel jack leg bin with 3-roller bin gates for loading.

For details of improvements and new combinations in Telsmith Portable Crushing Plants, *write for Bulletin P-34.*

P-3-37

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE, WIS.

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

50 Church Street New York City | 201 N. Wells Street Chicago, Ill. | 1013 Commercial Trust Bldg. Philadelphia, Pa. | 81 Binney Street Cambridge, Mass. | 412 Westinghouse Bldg. Pittsburgh, Pa. | Brandeis M. & S. Co. Louisville, Ky.

TELSMITH Portable CRUSHING, SCREENING AND LOADING PLANTS

One Hot-Mix Plant Serves Two Jobs

(Continued from page 6)

ed; the local Saugus water lines were relocated; the gas and electric lines for the community had to be moved; and the telephone wires had to be moved farther from the center line of the old roadway because of the width of the new project. In all there was a total of $100,000 expended by the utilities for moving their lines. The engineers and the contractors report the utmost co-operation on the part of all the utilities, both public and private, in coordinating their work to cause the least interference with each other and the carrying on of the contract itself.

The Hot-Mix Plant

To furnish the bituminous concrete for the 3-course pavement the sub-contractor, Warren Bros. Roads Co., set up a large plant at about the midpoint of the Perini contract and about one mile from the road. The pavement consists of a 3-inch course of bituminous concrete base, and a bituminous concrete surface laid in two courses of 2 inches and ½ inch. In addition to furnishing the material for this job, the plant also supplied all the surfacing material for the section of the Northern Circumferential Highway which crosses this contract.

Four sizes of aggregate, sand and three sizes of crushed trap rock were used for the bituminous concrete. The stone was supplied by the Concrete Materials Co., which maintained a quarry adjacent to the plant and the sand was trucked in by the producer and stock-piled close to the stone in barricaded bins on a slope. From the bins a Brownhoist crane with a 1¼-yard clamshell fed two steel bins, one of 150 tons for the stone and one of 75 tons capacity for the sand. Each bin was equipped with a Jeffrey vibrating feeder delivering to the boot of a bucket elevator to the drier. In order to remove any oversize stone a bar screen was installed beneath the feeder from the stone bin.

The Warren Bros. drier, 30 feet long and 72 inches in diameter, was supplied with heat by five Gem fuel oil burners. A large Sturtevant blower pulled the hot gases through the drier and removed dust at the same time. It was connected with a long horizontal flue built of wood and in which were installed sprays to knock down the dust before it reached the dust house where additional sprays laid the last of the dust.

The hot elevator raised the dry material to the top of the plant where it was screened by a 4-deck Robins vibrating screen and delivered to four bins. These contained: No. 1, sand; No. 2, ¼-inch stone; No. 3, ½-inch stone; No. 4, up to 1¼-inch stone. Beneath the bins was the batcher for the stone equipped with Howe dial scales and the asphalt weigh bucket with the same make of scales. The feed line to the asphalt bucket was 3-inch pipe with a ¾-inch steam line inside to keep the asphalt at the right temperature to flow easily. The pump maintained a pressure on the line with a relief valve near the pump so that the asphalt was not circulated. The asphalt was supplied by the American Bitumuls Co. and was hauled to the job in 3,000-gallon semi-trailer tanks by the Cronin Trucking Co. The Warren Bros. asphalt pump, used also for supplying the weigh bucket, pumped the asphalt from the tank trailers to the two 10,000-gallon storage tanks equipped with steam coils.

A second Sturtevant blower taking its suction from the weigh box and the screen house and hot elevator casing was operated by a variable-speed motor and eliminated dust from these sources. A steam boiler furnished the steam for the operation of the mixer gates and for the coils and steam jackets. An 8,000-gallon fuel oil tank stored the fuel for the drier.

The bituminous concrete was mixed in 4,000-pound batches and was delivered to the job five batches to the truck load. The composition of the various batches by weight was as follows (fig-

(Continued on page 31)

C. & E. M. Photo
The Hot-Mix Plant of Warren Bros. Roads Co., Subcontractor for the Bituminous Concrete Paving

Mall CONCRETE VIBRATORS

PROVED BEST BY PERFORMANCE ON THOUSANDS OF JOBS!

Contractors and engineers the world over proclaim the unusual satisfactory results received from these efficient tools

Placing dry mixes of concrete with a Mall universal vibrator

MALL concrete vibrators compact the dry mixes of concrete FIRMLY against the reinforcing steel and forms. Aggregate pockets or honeycombs and EXPENSIVE patching are eliminated.

There is a type and size of MALL unit—gas engine, air, or electric, for your job. There is a MALL unit that will help you secure better quality concrete at reduced costs!

MALL TOOL COMPANY

7743 South Chicago Avenue Chicago, Illinois

OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

FLASH!

BIGGER AND BETTER HEIL MANUFACTURING AND DISTRIBUTING FACILITIES READY TO SERVE YOU!

HEIL NATIONWIDE SALES AND SERVICE

• Two, modern, completely equipped Heil factories and a nationwide network of reliable Heil distributors are at your service to provide all of your requirements for hydraulic dump units, compartment truck tanks and snow plows. Resolve now to buy dependable Heil Hoists, bodies and tanks. Consult your nearest Heil distributor or write for free Heil literature . . . . Address:

THE HEIL CO.

GENERAL OFFICES: MILWAUKEE, WIS

Factories: Milwaukee, Wis.; Hillside, N. J.

Branches and Distributors Everywhere

Tractor Front End

SNOW PLOWS

Write for Circular on types, sizes and prices

White Mfg. Co.

ELKHART INDIANA

SATISFACTION WITH HUBER

Write FOR NEW DESCRIPTIVE LITERATURE

Full roller bearing equipped . . . three working speeds in both directions with a high for fast transport. . . . Heavy Duty Six Cylinder Engine—Gas or Diesel. . . . Both hand and power steering —instantaneous change. . . . Trouble free, low pressure Hydraulic Control. These and many other exclusive features are found on Huber Rollers.

The Huber Manufacturing Co., Marion, Ohio

HUBER Motor Rollers

FROM 5 TO 10 TONS . . . GASOLINE OR DIESEL POWER

RINGING IN HEALTH

The 1937 Christmas Seals

BUY and USE them

The National, State, and Local Tuberculosis Associations in the United States

From Coast to Coast — In the Shop and on the Job

ALEMITE POWER GUNS

ARE CUTTING COSTS FOR CONTRACTORS

FROM Oregon to Connecticut, wherever construction machinery is used, contractors are cutting lubrication time and increasing the productive time of each machine by using Alemite Power Guns.

Take the case of Silliman & Godfrey in Bridgeport, Connecticut: Their equipment includes 28 eight-ton Mack trucks, 1 Rex Paver, 4 Marion Shovels, a 1½-yard P & H crane, 2 Caterpillar graders, and 2 Caterpillar Diesel tractors. They've found that with the Alemite Electric Power Gun (Model 6190) shown above, they can clip *valuable* minutes from the lubrication on each machine. And when you multiply those minutes by 38 machines, you get a good many hours — worth plenty of dollars an hour on the cost sheets!

That kind of cash saving means not only *added profit* at the end of the job, but it also means *meeting contract dates* more easily — and penalties avoided! And when you combine the time-saving of Alemite Power Guns with the proved efficiency of Alemite Lubricants, you have a combination which thousands of contractors recognize as "tops" in construction machinery lubrication!

Cut *your* lubrication costs — protect *your* equipment against bearing failures and expensive breakdowns — by using Alemite Power Guns and Alemite Lubricants on all your machines. Mail the coupon for your FREE copy of "Alemite Controlled Lubrication." It has helped plenty of contractors to save big money!

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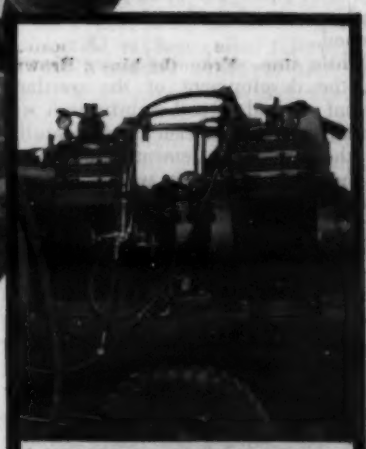

ALEMITE SERVICE TRUCK SAVES TIME ON JOB

These Alemite Power Guns, mounted on a special service truck together with air compressor and other equipment, travel right out to the job where trucks and tractors are working 24 hours a day. J. A. Lyons, Portland, Oregon contractor, *says that with these guns it takes only 15 minutes to lubricate a big Diesel tractor — as against 45 minutes formerly required when the job was done by hand!*

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Stabilized Bases Tested in Missouri

Asphalt, Tar, Emulsions And Cement with Various Methods of Mixing Used on Experimental Sections

By F. V. REAGEL, Engineer of Materials, Missouri State Highway Department

SEVERAL years ago, research was started by the Missouri Highway Department to investigate the possibilities of stabilizing soils by means of chemical treatment. The original idea grew from success met in surface treatment of earth surfaces with crude oil in Missouri and elsewhere. The basic theory involved was that the soils usually encountered would support normal loads if maintained at their optimum moisture content, and the only problem in cheaply stabilizing soil bases was to so treat the soil as permanently to stabilize the moisture content at or near the optimum percentage.

Work along this line of thought naturally gravitated toward the most easily available economical type of waterproofing agents, the bituminous materials. Several scattered projects, involving a number of sections of base, treated with a variety of bituminous materials, were constructed and the general service behavior studied. These studies were reported on pages 359-379 of the *Proceedings* of the 1936 Annual Meeting of the Highway Research Board.

A number of usable combinations were found that could be successfully laid with two types of application, the machine-mix method and the suboiling method.

While this work was being carried on, the development of the portland cement method of soil stabilization was initiated and was carried experimentally, by the Portland Cement Association, to the point where it was introduced into service in the form of development projects in a number of states.

The degree of success obtained with experimental projects under conditions of limited control led the Missouri Department of Highways to consider the comparison of the various methods under conditions conducive to experimental control and with special attention to the obtaining of accurate cost data in connection with the various types of manipulation and materials. Particularly it was desired to compare blade-mixing methods with the other methods previously used and requiring more elaborate equipment.

Experimental Sections

During the 1937 construction season, a project was designed to make the above comparisons and in addition included comparison with some more conventional types of bases, such as clay-gravel, waterbound stone macadam and macadam on specially treated sub-bases. This project consisted of approximately 13 miles of test sections located on Route 100TR between New Haven and Washington in Franklin County, Missouri.

The following is a list of the sections included in the comparison and shows the approximate length of the sections, the type of construction and the stabilizing agents used:

Washington, Mo., End. Section	Length Miles	Type of Base
		Standard Specifications
1	0.5	Telford base
2	0.5	6" macadam
3	0.5	4" macadam, 2" sub-base
4	0.5	2" macadam, 4" sub-base
5	1.0	Road-mix cement
		Barber-Greene Mix
6	1.0	Cement
7	0.25	SC-3 and 4 + gravel
8	0.25	SC-3 and 4
9	0.25	MC-3 and 4
10	0.25	SC-3 and 4 + gravel
11	0.5	Tar + gravel
12	0.5	Emulsions + gravel
13	1.5	*Activated + gravel
		Sub-Oiling
14	1.0	Tar + gravel
15	0.5	SC-2 and 3 + gravel
16	0.5	MC-2 and 3 + gravel
17	1.5	Emulsions
		Blade Mix
18	0.5	Emulsions
19	0.5	SC-3 tar + clay-gravel

New Haven, Mo., End.
*Activation consists of various combinations of oil, tar, furfural and aniline.

The series of bases listed have been completed and have been covered with either a bituminous armor-coat type of surfacing or a somewhat heavier drag-mix treatment. Careful study will be made of the behavior of the various sections under traffic and reports will be made available from time to time as developments occur.

A complete report of this project to date, including detailed cost records and a description of previous projects and the laboratory investigations leading to their construction, is being prepared for submission to the International Road Congress during the coming year, and will be available for publication at that time.

In general, it can be stated that the investigations to date have resulted in the development of a usable technique for three different methods of construction, machine-mix, sub-oiling and blade-mix, and give promise of the development of a combination of base and surface for low and medium traffic roads of increased durability at a considerable reduction in cost over combinations previously in use in this State in areas where cheap local materials are not available.

It makes no difference where the time goes. It's what you do with it that counts.

England Plans New Highway To Relieve Traffic Congestion

Plans for England's first highway designed exclusively for motor traffic, providing for a 54-mile trunk road running north and south through Lancashire, have been approved by the Lancashire County Council. It will bypass four towns, bridge two rivers and the Manchester Ship Canal, and besides expediting motor traffic will relieve traffic congestion and promote greater safety. The authorities in Cheshire and Westmoreland are to be approached with the idea of linking up their areas with the proposed plan.

The Lancashire plan, which it is estimated will cost between £5,000,000 and £6,000,000, will take about three years to complete.

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AMERICAN ROAD BUILDERS' ASSN. • 1902 •

New All-Welded Shovel Boom and Dipper Sticks

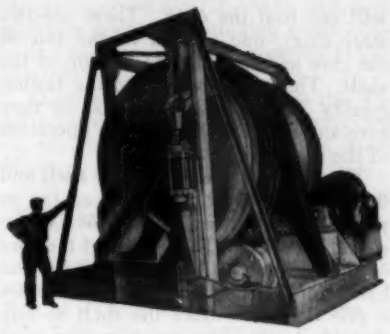
A new Link-Belt K-480 Speed-o-Matic extra-high lift crawler shovel equipped with all-welded steel boom and dipper sticks was recently built by the Link-Belt Co., 300 West Pershing Road, Chicago, Ill., for a large coal stripping operation. The shovel boom is 34 feet long with 48-inch diameter boom point sheaves and the dipper sticks are 28 feet long, allowing greater reach and spoiling height than the standard length of boom and sticks. The lower end of the boom is flared so as to eliminate "hog rods" and afford greater stability and strength.

In spite of the greater strength and size at the lower end of the boom, the welded design has reduced the weight 10 per cent, according to the manufacturer, and the welded all-steel box section construction takes full advantage of the weight of the machine.

The welding was done with Shielded-Arc equipment made by the Lincoln Electric Co., Cleveland, Ohio.

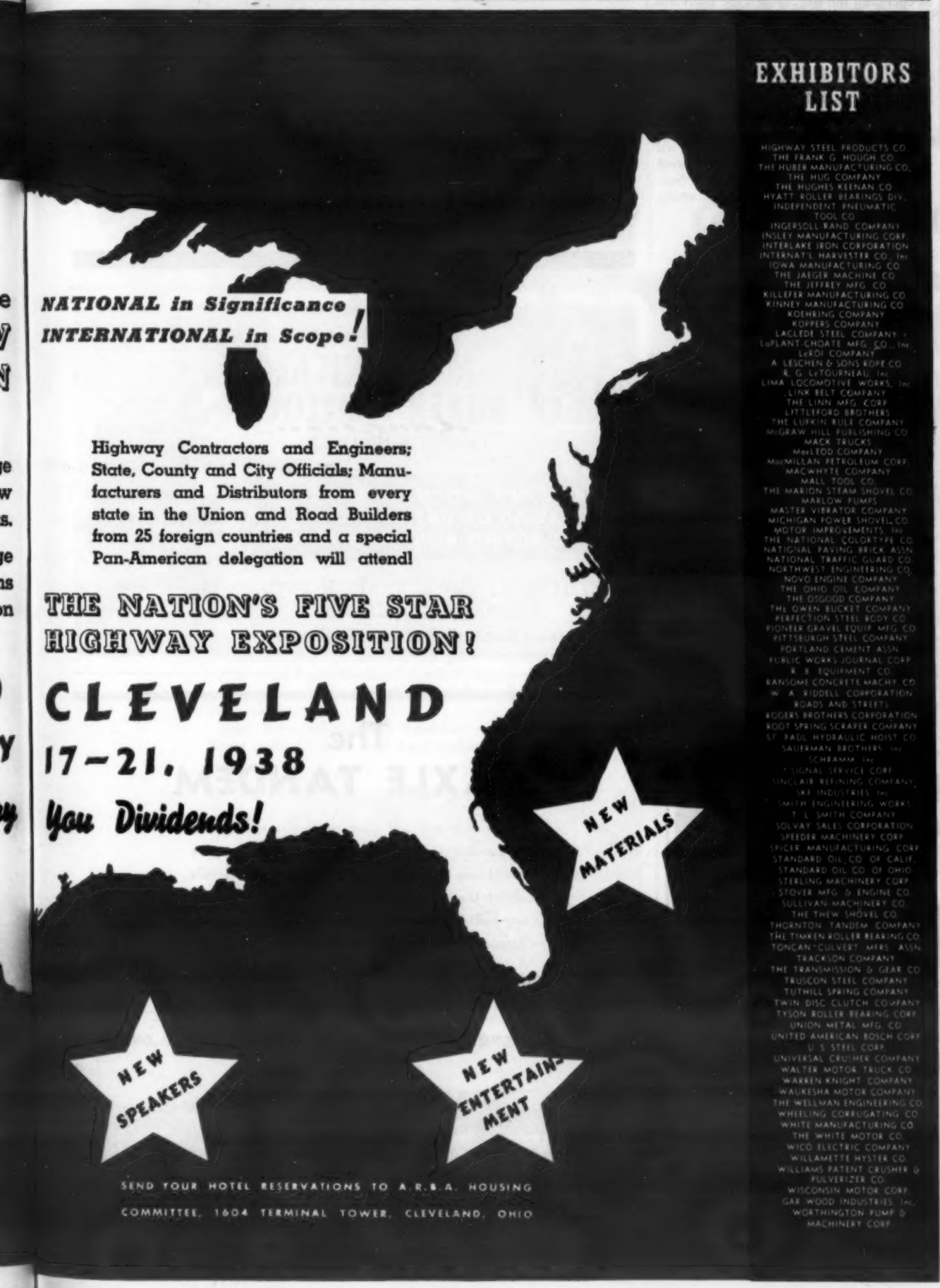
Largest Concrete Mixer

Ransome Concrete Machinery Co., Dunellen, N. J., reports that it recently delivered to The Liberty Corp., of Philadelphia, Pa., one of the largest concrete mixers ever installed in a central mixing plant. It is a Ransome 5-cubic yard unit with a pneumatically controlled discharge chute which is quickly and positively manipulated by a slight movement of a small lever in the control room. An Ingersoll-Rand air compressor supplies air for the control.



The Ransome 5-Yard Mixer Recently Installed in the Liberty Corp. Plant

The Liberty Corp. has a Ransome 3-cubic yard mixer in the same plant.



Spreading Hot-Mix On Wide Mass. Job

(Continued from page 28)

ures in pounds per batch):

Material	Black Base	Coarse Top	Granular Surface
No. 4 Bin	2,200	1,880	....
No. 3 Bin	640	500	1,780
No. 2 Bin	280	370	1,080
No. 1 Bin	720	1,040	920
Asphalt	160	210	220
Total Weight	4,000	4,000	4,000

Two engineers from the New England Inspection Laboratory acted as inspectors for the Massachusetts Division of Highways at all times.

The hauling to the job was done with a fleet of nine Brockway and White 10-ton trucks. The maximum haul for this job was 4½ miles, including the one mile of dead haul. The plant was operated in two 7-hour shifts and its best production with a 55-second mix working 14 hours and serving the two contracts was 1,260 tons. The best hourly production which was maintained for long periods was 88 tons per hour.

Spreading the Hot-Mix

The bituminous concrete was spread on the road by a self-powered Adnun spreader. Base was usually laid in the afternoon and the top for the same section the following morning. This permitted at least 12 hours for the setting of the base. Not infrequently, because of the speed with which the surface course could be spread, the base was spread and left uncovered for 1½ to 2 days. The mixtures were spread at an average temperature of 325 degrees F., and the limits were 300 to 350 degrees.

The rolling of the courses was started in each case with a 12-ton Buffalo-Springfield tandem roller followed by a 15-ton 3-wheel roller of the same make. The tandem was used first because of the wider rolls which gave a greater smoothing out of the surface on the first roll. The subcontractor averaged 500 feet of 34-foot bituminous concrete, three courses laid and rolled complete in 8 hours. The best day was 1,100 feet of 34-foot roadway complete in two 7-hour shifts.

The completed roadway on each side of the grass plot has a crown of 3/16 inch per foot, amounting to a 4½-inch crown 23 feet from the grass plot. The sidewalk section consisted of the concrete edgestone all precast on the job, a 4-foot grass plot, a 4-foot bituminous concrete sidewalk, and a 4½-foot grass plot.

In driving over the completed work it was interesting to note the difference in color of various sections of the surface. These variations of color were not due to any change in aggregate sources or changes in the asphalt content or brand but entirely to the time the material had been in service under traffic. There was no bleeding but the material as laid was much lighter in color than after it had been under traffic for a few weeks.

Personnel

This 4.68-mile contract was started October 27, 1936, and completed before the contract date of October 30, 1937, by B. Perini & Sons, Inc., of Framingham, Mass., and the subcontractor on paving, Warren Bros. Roads Co. of Boston, Mass. John L. Doherty was Superintendent for Perini and E. M. Pearson was Superintendent for Warren Bros., with Edward Sullivan as Plant Foreman. For the Massachusetts Division of Highways the work was in charge of Lewis Fritz, Resident Engineer.

A new phase of the problem of silicosis in the construction industry will be discussed in an article on dust diseases in our December issue.

The Approach Road and the "Kiss of Death" Bridge Now Illuminated With G-E Sodium Lights

"Kiss of Death" Bridge Now Has Sodium Lights

The grim title "Kiss of Death" Bridge given to the Sims Bayou Bridge on the La Porte road just outside of Houston, Texas, was acquired because of a serious night automobile accident in which three persons lost their lives. The accident occurred when a bridegroom, unaware that the car was approaching a bridge, kissed his very recent bride, during which interval the car struck a part of the bridge structure and overturned.

As a result of the number of night-time accidents at this bridge the approach and span have now been lighted by sodium safety lights developed by General Electric engineers. These units provide a mellow orange-yellow illumination which reveals objects on the highway in time to stop or avoid them.

New Core Punch Bar For Ditch Blasting

A new ditch blasting tool for use where the excavation is in wet soil, designed by H. O. Ashley of Sibley, Ill., has recently been announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela. This Ashley core punch bar is a combination hole-making and dynamite-loading tool which applies the principle of a pile driver to the old method of using a core punch bar.

The tool consists of 1½-inch standard pipe, with handles attached, as an outside shell. The core which fits inside the shell is 1-inch standard pipe, with a steel point 1⅝-inch in diameter on the lower end and a pipe T handle on the upper end. The point fits closely inside the shell but the core pipe fits loosely, so that any material sliding by the point will not foul the core. There are two steel rings, one welded to the top of the core and the other to the top of the shell. These are the key to the lasting quality of the tool, inasmuch as they give and take the shock in the operation of the bar.

The core is placed inside the shell and the two together are pushed as far as possible into the ground at a point where a load is desired. The handle of the core is then swung at right angles to the handle of the shell and the core becomes a pile driver to drive the shell to any desired depth. The point on the core extends below the shell so that at each stroke the point goes through the end of the shell, wedging out any material which might enter and forcing material below the shell to one side. At the same time, a steel ring at the top of the core hits the shell at each stroke, driving it deeper into the soil. When the shell has been driven to the desired depth, the core is removed, and the dynamite dropped into place, and can be held there with a wooden tamping stick until the shell is pulled free.

This tool, which is also suitable as a stump blasting tool, can easily be made in a contractor's shop. Complete information on the tool and a sketch with all dimensions may be secured gratis direct from the Agricultural Extension Section, du Pont Company by mentioning this magazine.

New Load Transmission Device for Road Joints

A load transmission device for use in concrete highway construction is made by the American Concrete Expansion Joint Co., 221 No. La Salle St., Chicago, Ill. This device, known as a J-Bar, is used with expansion and contraction joints and provides the means of transmitting vehicle loads from one slab to the next. J-Bars have been approved by the U. S. Bureau of Public Roads and over 1,000,000 are already in service, according to the manufacturer.

Each J-Bar unit consists of a pair of malleable iron sleeves provided with integrally cast radiating arms at one end. The castings weigh but one pound each and are reamed so as to permit a short cold-rolled steel shaft ¾-inch in diameter to be fitted inside the cylindrical bearings of the castings. The flanges of the sleeves fit snugly against the side of the joint so that the shafts extending through the joint are located perpendicular to the joint material.

In Illinois, where J-Bars are specified, twelve of these units are used in each 20-foot transverse road joint. In recent installations there, 176 joints per mile were used.

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YOUR own heaviest job-requirements are all in the day's work for Heltzel Steel Road Forms. It is a fact that more solid rigidity and strength are built into this equipment than you are ever likely to fully utilize. ● Rigidity is assured by extra width threads, downturned reinforcing flanges, non-buckling vertical flanges, and broad bases. Non-clogging stake pockets of pressed steel act as diagonal braces, absorbing side-thrust of heaviest sub-graders and finishing machines. ● Rigidity is but a part of the story. For complete details, including Heltzel's 17 points of definite superiority, send today for our Road Form Bulletin, No. 101.

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PATENTED
MECHANICAL
MIXER TIMELOCK
WITH COUNTER
OPERATES OFF THE MIXER SHAFT—CAN BE INSTALLED ON ANY ASPHALT PLANT. APPROVED BY STATE HIGHWAY DEPARTMENTS.
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CMC MIXERS GET THOSE JOBS DONE IN A HURRY!

CMC 7s and 10s End Discharge Models. New—compact—fast. The advantages of a speedy trailer with four wheel stability.

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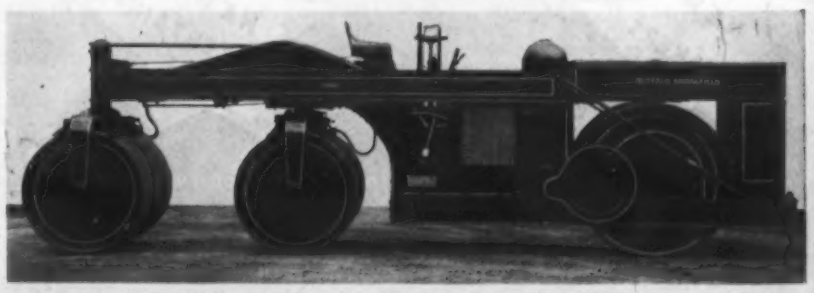

Disposition of Motor Vehicle Fees and Motor Fuel Taxes

The net total receipts from motor vehicle fees in 1936 amounted to $361,510,000 and from motor fuel taxes, $683,074,000. Collections and other administrative purposes absorbed $28,651,000 of the motor vehicle receipts and $6,227,000 of the motor fuel tax receipts. Of the amount left, state highway departments received $188,824,000 from motor vehicle fees. Construction, maintenance and administration took $126,400,000; police, $10,230,000; bonds, $40,589,000; local obligations assumed, $11,605,000; local roads and streets received $96,912,000 and non-highway purposes took the remainder, $46,603,000 being allocated to general funds, relief and education.

From the motor fuel taxes, state highway departments received $389,125,000 and spent $288,155,000 for construction, maintenance and administration; $3,537,000 for police; $64,711,000 for bonds; and $32,722,000 for local road obligations assumed. Local roads and streets received $167,255,000, and non-highway purposes, including relief, education and general funds, received $119,408,000.

These figures are taken from the Annual Report of the Executive Secretary of the American Association of State Highway Officials.

English Pedestrian Subway

A pedestrian subway under a much-used highway, and reported to be the first of its kind constructed in England, was officially opened in June. It was constructed, at a cost of about $25,000, beneath the Watford by-pass road to Mill Hill Park, Hendon, and is designed to permit six persons to walk abreast through it. It is built of reinforced concrete with glazed brick facings and is only 4 feet below the road surface. Regarded as experimental, it is a further step in the efforts being made in England to reduce the high rate of road casualties, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

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HIGHWAYS
at low cost

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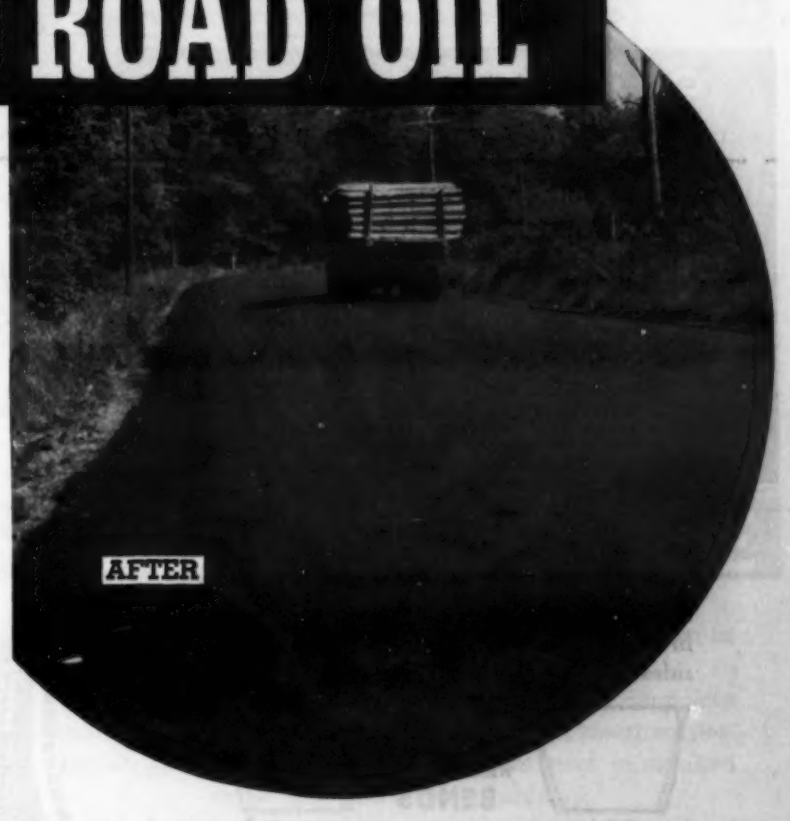


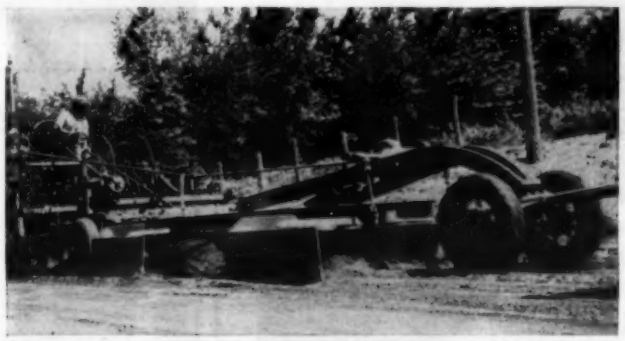
● Oil and mineral aggregate surfacing offers a definitely economical method of highway improvement. The mineral aggregate used can be any one of a great variety of materials. Usually a suitable aggregate can be found in any locality.

Houghton County, Michigan, road improvement illustrated here, offers an example. Stamp sand, a by-product from the copper industry in that territory, was used as the aggregate. Standard Asphalt Road Oil and stamp sand, *mixed on the road,* transformed a treacherous, dusty road into a clean, non-skid, all-weather highway.

Standard Asphalt Road Oil mixed with local mineral aggregates provides safe, easily maintained roads, at a cost within reach of every county. *Low* original cost means less initial investment and lower interest charges—true *low cost.*

Let your local Standard Asphalt representative give you specifications and costs of this method of road surfacing in your community.

Use Standard Asphalt Products and get *more* miles of *better* roads for your road fund dollars.



TOP—*"Bootjack" road Houghton County, Michigan before treatment, showing dusty, unstable condition.*

ABOVE—*"Bootjack" road after processing, provides a smooth, dustless highway through this scenic section.*

LEFT—*Mixing Standard Asphalt Road Oil and Stamp sand on the road.*

Asphalt for every purpose STANDARD OIL COMPANY (INDIANA)

Tennessee Concrete Job Moves Rapidly

(Continued from page 19)

¼-inch steel were dropped into the slot and later removed by the finishers.

The joint finisher removed the cap from the expansion joint material and carefully edged on both sides and then completed the edging of the dummy joints. The final operation was the edging of the sides and the wire broom finish on the slab just before the water disappeared from the surface.

Curing and Moving Forms

The brooming of the wet concrete was done at right angles to the center line to relieve drivers' eyes from the glare of the sun on the concrete. As soon as the wire broom marks were impressed on the pavement it was covered with burlap kept damp on a bridge and spread by two men. The burlap was sprinkled over night and then removed the following morning and the dummy joints poured with asphalt heated in a Littleford kettle and neatly placed in the slots by hand pouring pots.

A crew of ten men pulled the forms and cleaned them on the day following the pouring of the concrete and they were loaded onto a pair of flat-bed wagons hauled by pairs of mules. After this operation the pavement was covered uniformly with 2 inches of earth from the shoulder by a crew of six men working three on a side, and the earth kept wet until the test beam from that section showed a test of 500 pounds per square inch in breaking. This usually was at the end of five days.

The water for the paver and for the various sprinkling operations was furnished by a C.H. & E. No. 11 triplex pump delivering water from a creek to a 2½-inch pipe line laid along the shoulders and with paver hose valves set into the line every 200 feet.

Personnel

This Federal-Aid Project 251-B was awarded to Walker & Michael of Memphis, Tenn., on a bid of $136,816.66 and was completed with an average paver run of 1,170 feet in 11½ hours of operation per day when the project was 66 per cent completed. For the contractor W. D. McCleish was Superintendent and for the Tennessee Highway Department W. B. Haynes served as Resident Engineer.

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It pays to depend on snow plows for your trucks or tractors that are selected from a line that has stood the test for the last thirty years. You can always depend on a Baker.

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THE BAKER MFG. CO.
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AMERICA'S OLDEST MAKER OF SNOW PLOWS FOR STREETS AND HIGHWAYS.

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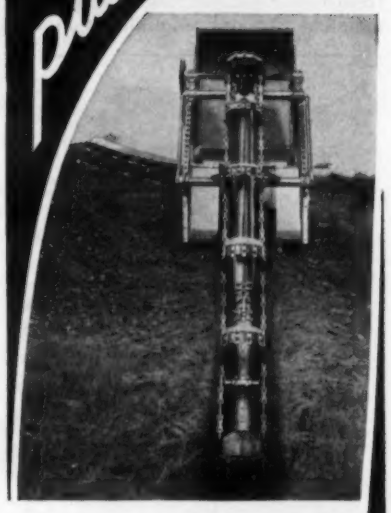


When your line for a ditch runs close to buildings, misses trees or poles by inches, or hugs the curb, it is time to get acquainted with the new Buckeye Model 120, and its shiftable boom.

Here is a Buckeye Ditcher, built to handle those difficult ditching jobs. It does the simpler jobs with equal efficiency, saving you time and money on any ditching job within its range of trench - 16" to 30" wide, and to 10' depths.

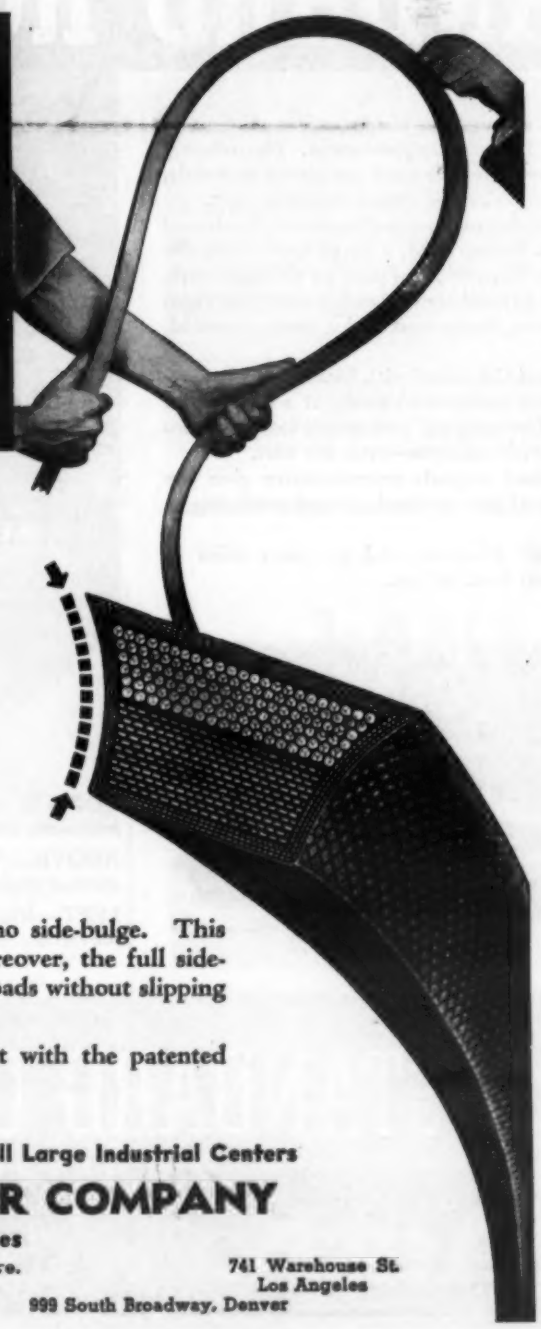
Write today for special bulletin.

• THE • BUCKEYE TRACTION DITCHER COMPANY • FINDLAY • OHIO •

Your Solution TO THE WATER AND SMALL SEWER DITCHING PROBLEM

Buckeye MODEL 120 Service Ditcher

This Simple Test Shows WHY V-Belts NEED THE CONCAVE SIDE



Bend *any* V-belt and *feel* its top narrow under tension, its bottom widen under compression. You will see that a *straight-sided* V-belt *must* assume in its sheave-groove the shape shown in figure 1, below. Note the out-bulge of the sides!

FIG. 1 FIG. 2

Now try the same test with a Gates Vulco Rope. You will find that the *same shape change* merely *straightens* the precisely engineered concave side (see figure 2). There is no side-bulge. This insures uniform side-wall wear; *longer* life! Moreover, the full side-wall grip on the pulley naturally carries heavier loads without slipping —a saving in belts and also a saving in *power!*

The Gates Vulco Rope is the only V-Belt built with the patented concave side.

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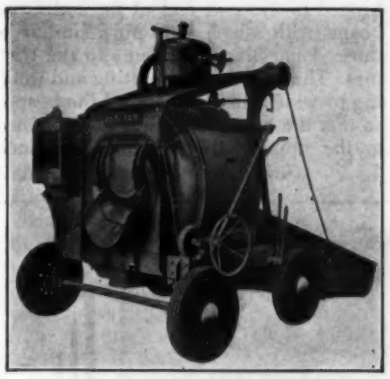

The New Streamlined Rex Mixer

A New 14-S Mixer

A new streamlined 14-S concrete mixer has recently been announced by the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis. Features of this machine, which is entirely new in design, are faster charging and discharging, lighter and stronger frame, new accurate water control, and increased engine power.

Charging has been made faster by the use of a Shimmy Skip which, together with the streamlined shape of the skip, discharges the batch into the drum with a free fast-sliding action. The drum, with an up-and-over mixing action and oversize buckets, has one-piece construction with the pressed steel drum heads welded integral with the center sheet. Discharging through an extra-large drum opening onto the streamlined chute, the drum is completely cleaned in 7 seconds, according to the manufacturer. The new Rex water system with a new vertical measuring tank and non-bypass free-way valve is designed for accuracy and allows no water to dribble into the drum.

Mounted on a rigid steel frame, the mixer is supported from the axles by strong coil steel springs at each wheel and has automotive-type steering. It is furnished in four-wheel end or side-discharge types with pneumatic, solid rubber, or steel tires. The power plant is a Le Roi 25-hp radiator-cooled gasoline engine. A Rex batch-meter and centrifugal water pump are optional equipment.

McNutt Joins Adv. Agency

George C. McNutt, who for the past two and a half years has been advertising and sales promotion manager for R. G. LeTourneau, Inc., of Peoria, Ill., and Stockton, Calif., has recently joined Bert S. Gittins, Advertising Agency, of Milwaukee, Wis., to assist in handling that agency's industrial accounts.

BIGGER YARDAGE!

Williams
MULTIPLE-ROPE BUCKET

Double Hinge design not only permits a longer spread of the open bucket, but more rigid and powerful construction. *Write for Bulletin.*

THE WELLMAN ENGINEERING CO.
7012 Central Avenue, Cleveland, Ohio

WILLIAMS
POWER-ARM, POWER-WHEEL, MULTIPLE-ROPE, DRAGLINE ..... buckets

An Improved Method Of Galvanizing Iron

An entirely new method of galvanizing sheet with a heavy coating of commercially-pure zinc that will not crack or peel when it is subjected to relatively severe drawing or forming operations has been announced by the American Rolling Mill Co., Middletown, Ohio. The new material, produced in both sheets and coils, is known as Zincgrip and carries from 50 to 75 per cent more protective zinc than tight coat sheets generally used for fabricated products, according to the manufacturer.

It is an accepted fact that zinc provides an excellent protective coating for iron and steel sheets. Broader use of heavily coated galvanized sheets has been restricted only because relatively severe fabricating operations fractured the zinc coating. With the new Armco Zincgrip sheets, exceptionally good adherence is obtained, irrespective of the weight of the coating.

STERLING No. 3 CONCRETE CARTS

STERLING No. 3 CART
This cart can be furnished with pneumatic tires

30" or 36" dia. wheels, 6 cu. ft. capacity, 14 gauge tray, underslung heat-treated axle, plain or roller bearings.

A COMPLETE LINE OF STERLING WHEELBARROWS AND CONCRETE CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Get Low Cost Gravel at the Job with an AUSTIN-WESTERN PORTABLE

● Avoid the high cost of long haul crushed stone, sand, and gravel with an Austin-Western crushing and screening plant. Save the profits of the fixed plant producer and maintain these savings by operating from the nearest pit or quarry.

Austin-Western plants are designed for easy portability. Even the complete No. 100 shown here with its primary jaw and secondary roll crusher, its power unit and complete screening equipment is easily portable on its own pneumatic tires and it can be set up in an amazingly short time.

Regardless of size, Austin-Western crushing equipment is designed for top output at lowest operating cost. Oversize S. K. F. bearings mounted on oversize shafts make these crushers able to withstand enormous shocks.

For these reasons their unusually deep jaws can operate at highest speeds, boosting production and reducing the cost of crushed stone and gravel to a minimum.

Ask us to suggest a plant that is best adapted to meet your requirements for gravel or crushed stone, or use the coupon for details of the complete line of Austin-Western crushing equipment.

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AURORA, ILLINOIS

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Gila Project

(Continued from page 20)

the top after every shot. This was sometimes done with a pointed bar in the two top drills. The rock in this tunnel often broke into large boulders, causing considerable trouble in mucking, until the head of the Conway mucker was raised 13 inches by inserting built-up steel blocks at each side, so that the oversize rocks could be loaded.

A Pennsylvania 750-cfm compressor at the shop between the two tunnels supplies air through 6-inch pipes. An Ingersoll-Rand forge and Gardner-Denver sharpener are used at the shop. Sharpening is facilitated by a triangular wood platform on which the steel is placed, with the short bars at the corners and long ones on the wide portion of the platform.

Tunnel No. 2, now in about 1,600 feet, is being driven from the east portal and will be 4,124 feet long. The approach, through a narrow ravine, was drilled and blasted by a jackhammer crew while No. 1 was under way. Later this crew drilled and excavated the open approach to this tunnel at the west portal, using the equipment previously described.

Some 1,500 feet of No. 2 was in a pink lime formation, thickly studded with calcite crystals. Little timbering was required, and most of this was with steel ribs. The tunnel is now in cemented gravel, which is expected to prevail until the west portal is reached. In this gravel Hercules 30 per cent 1½ x 12-inch stick powder is being used to load the rounds. Some trouble is experienced with holes raveling in the cemented gravel, thus preventing loading. A Buffalo blower at the portal furnishes air to the miners through a 22-inch pipe swung to the side of the tunnel. Driving methods are the same as used in No. 1. Muck is hauled to the portal in Koppel side-dump cars, pulled by three Mancha electric locomotives, using a "California switch" in effecting transfers inside. From the portal they are pulled to the dump, below the open canal, by a Plymouth locomotive. Hugging the rock rim of the approach cut, the track is lighted at night by double globes installed with dish-pan reflectors. A first-aid outfit is installed at the portal.

In blasting the cemented gravel in the open cut at the west portal, holes are drilled to a maximum depth of 24 feet, and spaced 16 to 20 feet, according to the ground. They are sprung twice, using 12 to 14 1¼ x 12-inch sticks of Hercules or du Pont gelatin for the second chambering and tamping with a gallon or two of water. After blowing out the holes they are each loaded with 2½ to 3 cases of Hercules or du Pont bag black powder. From 50 to 300 holes are fired at a time. Both tunnels are to be lined by Mittry Brothers with reinforced concrete, varying in thickness from 10 to 16 inches where there are no steel ribs. In ribbed sections the lining will be 8 inches. Reinforcing will consist of ⅝-inch bars on 12-inch centers, both ways, and attached to anchors of 1-inch square steel on 6-foot centers. Lining will probably begin after No. 2 is dug. The Koehring shovel was used in all outside excavation, banks of the open canal being smoothed by hand labor, after close work with the bucket of the Koehring dragline working from the top of the canal.

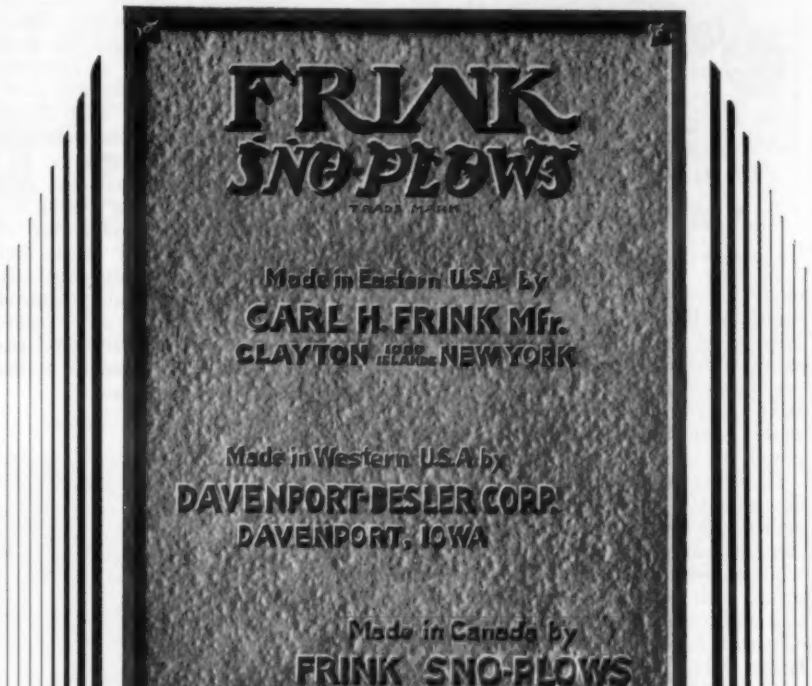
Schedule 4

Schedule 4, Sta. 408 to 931, comprising 2,255,000 cubic yards of common and 40,000 cubic yards of rock excavation and 50,000 cubic yards of excavation for drainage and dikes, was let to Boyce & Igo, for $200,400. About 2 miles of cemented gravel, in addition to the rock sections on both sides of the Gila river, and considerable adobe mixed with the gravel, makes this schedule one of hard digging.

In order to handle the heavy work expeditiously a Bucyrus-Monighan 10-W dragline which had been parked near the railway at Araz, after finishing the company's subcontract on the All-American Canal, except for a couple of canal plugs which will be removed later with minor equipment, was moved to the new job. Work with this machine was started in July, and about 100,000 cubic yards had been excavated in August. This dragline has a 175-foot boom and 15-cubic yard bucket, and is excavating the channel from the right-hand bank, where it is constructing a road across numerous ravines as it goes. The 3-yard Northwest is constructing drainage channels and dikes. The 3-T is not in use at present.

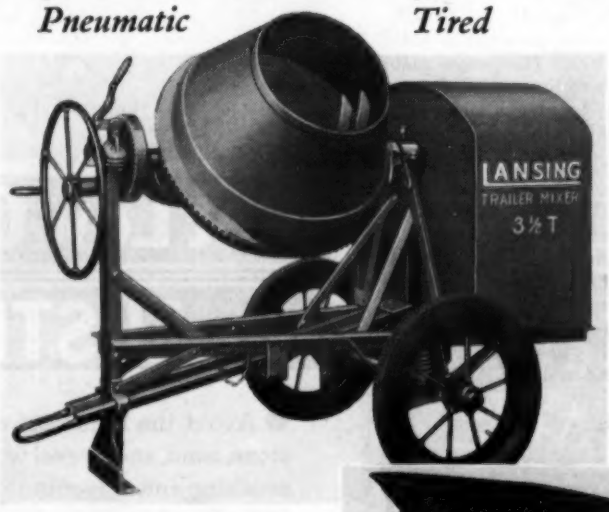
Moving the 10-W to this schedule was something of a problem, as the firm's other two draglines were already on the Gila job, and no major power was available for dismantling the big machine at Araz. It had to be taken apart and moved by truck. A Gardner-Denver compressor, mounted on a sand sled, was taken to the site and, driven by a 30-hp Caterpillar and belting, furnished air for Chicago-Pneumatic rivet busters. Two 75-hp Caterpillar tractors were equipped with 30-foot web booms, hinged to the rear end of the bulldozer beams with 3-inch steel pins, similar to those connecting the beams to the tractors. This was done by cutting and welding to widen the back end of the beams, so that the boom ends could be attached to the upper half. Sections of 1-inch

(Continued on next page)



—fast . . economy . . low cost

Pneumatic *Tired*



MORTAR MIXERS
CONCRETE CHUTES
WHEELBARROWS
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CONCRETE MIXERS
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SCRAPERS

new LANSING 3½-T Mixer

One of Lansing's dependable concrete mixers — the fast, rugged 3½-T. Better on the job—and better profits for the owner.

Timken and Hyatt Roller Bearings; large, quick-mixing drum; Alemite fittings; Lauson 2 h.p. gasoline engine; pneumatic rubber tires—and other dominant features. Ask for special Lansing Mixer catalog—and other information.

***Popular* LANSING Barrow**

The F-4 ½ Barrow is outstanding with its deep tray; reinforced frame; channel-iron legs; Never-slip type axle; 16" wheel with ball bearings. Capacity 4½ cu. ft. (dry). EASY loading and dumping. Ask for Bulletin L-12, prices, etc.

LANSING

LANSING COMPANY, Lansing, Michigan

CHICAGO NEW YORK PHILADELPHIA BOSTON MINNEAPOLIS KANSAS CITY SAN FRANCISCO

Gila Project

(Continued from preceding page)

plate to fit were welded on each side of the beam end, with the pin through all.

A cable from the drum of the power unit on the rear of the tractor was threaded through a small pulley attached to the boom near the drum, and then through a sheave block at the top of the boom and down to a specially constructed hoisting block at the sling. As parts up to several thousand pounds were cut loose from the dragline they were carried by the Caterpillar crane to a truck, or to loading platforms nearby. To aid in balancing the machines when carrying a load, steel drums were filled with sand and chained to the bulldozer. The top of the boom was guyed to the front of the tractor, and in lowering some of the heavier parts of the dragline deadmen were buried and cables attached to them and to the top of a mast.

At the erection yard on the Gila job the heavier lifting was done with the Bucyrus-Monighan 3-T and the Northwest, assisted by the tractor-cranes which handled the lighter pieces of steel. Before assembling the many parts of the dragline, the inevitable coating of sand and grease was removed by cleaning with Cee-Bee Compound, used in a Kerrick Kleaner. This device employs live steam, mixed with the compound, and was particularly useful in cleaning bearing surfaces, and inaccessible parts of the diesel engines. Air for riveting was furnished by a Gardner-Denver compressor, mounted on a sand sled, along with a 75-hp Caterpillar diesel engine, which drove the compressor by V-belt. A metal fuel oil tank was also mounted with this unit.

Bond plowing on the Boyce-Igo contracts has been speeded by the use of a four-bottom farm lister, with crooks of the beams strengthened by welding on half-moon sections of ½-inch plate, cutting bars welded edgewise to the front of the moldboards and the points welded in place. It is pulled by a Caterpillar Sixty.

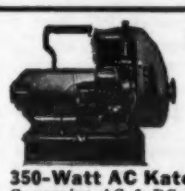
Four 6-hour shifts are worked by the draglines, with four men on each shift at the Bucyrus-Monighan, and three on the Northwest. There are three tractor drivers, three men grubbing right-of-way, one welder and three day men at the shop. One man is relieved each week to adjust hours and avoid a shutdown.

At the Gila river, in Schedule 4, a reinforced concrete siphon will be constructed, with 19½-foot barrel. Contract for this work has not yet been awarded.

Personnel

Roy B. Williams has been Construction Engineer for the Yuma office of the United States Bureau of Reclamation until his recent appointment as Assistant Commissioner for the Bureau in Washington, D. C. Paul A. Jones is Resident Engineer in charge of the Gila Valley Canal. J. C. Thrailkill is Chief Clerk for the Bureau and T. A. Clark Office Engineer. Roy L. Igo is overseeing that firm's contracts, with Rex Igo, Superintendent. Oscar Mittry is in direct charge of his firm's tunnel work.

The American Road Builders' Assn. Road Show in Cleveland January 17-21 will be the biggest and best ever held. Don't miss it!



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Gas-engine AC & DC Plants Up to 10,000 Watts
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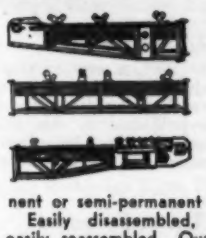
NEW WAYS TO CUT MATERIALS HANDLING COSTS



The flexibility and adaptability of the Porta "Model 347" sectional conveyor offers wide opportunities for cutting costs and increasing profit in the handling of concrete and aggregates.

Made up of independent sections.

Can be used on wheel truck, caster mounting or on supports as permanent or semi-permanent conveyor.

Easily disassembled, easily transported, easily reassembled. Our catalog describes our complete line of portable, sectional, and permanent conveyors designed to suit every contractor's requirement.

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BUYING A MIXER?

DEMAND:

- Faster Charging and Discharge Speeds,
- Machined Steel Tracks,
- 2 Wheel Mounting with Timkens and Pneumatics,
- End Discharge Advantages,
- Man-Ten Alloy Steel,

Send for New Catalog, Prices 3½S to 56S Sizes.

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Earn the BONUS

WHETHER you complete that job on time, and get the bonus, or fail, and pay a penalty . . . depends more than you may think on the lubricating oil in your Diesel engines.

Thousands of Diesel operators maintain better engine compression by lubricating with Texaco Algol and Ursa Oils.

Texaco Algol and Ursa Oils are in a class by themselves because they keep piston rings free and active in their grooves for longer periods of operation.

Trained lubrication engineers are available for consultation on the selection and application of lubricants for any purpose. Prompt deliveries assured through 2070 warehouse plants throughout the United States.

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Delay can be costly in engineering and construction work. With Texaco Algol or Ursa in your Diesels, you can count on more continuous operation.

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TEXACO URSA OILS *FOR ALL TYPES OF DIESELS*

Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

New Pipe for Subdrainage

362 Skip-Pipe, a cast-iron under-drain pipe constructed on a new principle, which operates by gravity flow and has a sloping cradle to carry off the water, is described completely in a new 12-page broadside which interested contractors and engineers may secure direct from the Dimick-Mosher Products Co., 120 Boylston St., Boston, Mass.

New Spray Equipment Catalog

363 A new complete 60-page catalog covering the Binks line of spray painting and finishing equipment, including spray guns, pressure painting outfits, spray booths, air compressors, hose and connections, respirators and masks, and the road striping outfit, has recently been issued by the Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill., which will be glad to send copies on request.

New Vibrator for Mass Concrete

364 The Roeth gasoline-engine-driven vibrator for mass concrete which is mounted on a wheelbarrow or two-wheel chassis for easy portability is described in Bulletin 3 which the Roeth Vibrator Co., 1735 Farragut Ave., Chicago, Ill., will be glad to send on request.

Catalog on Wheelbarrows and Carts

365 Catalog No. 14, a 100-page booklet recently issued by the Lansing Co., Lansing, Mich., contains information on its complete line of equipment, including concrete carts and wheelbarrows in various styles and sizes, hand trucks, concrete mixers, dirt-moving scoops, hand tools, wheels of all sizes and purposes and other Lansing equipment. Copies of this catalog may be secured direct from the manufacturer.

Air and Water-Cooled Engines

366 A new booklet, Catalog F, describing and illustrating Lauson vertical air and water-cooled engines in ½ to 5-hp sizes for driving generators, battery charging sets and similar applications has recently been issued by the Lauson Co., 55 Michigan St., New Holstein, Wis., which will be glad to send copies on request.

Tractors for Winter Warfare

367 A new 15-page booklet "Winter Warfare," illustrating the use of Caterpillar diesel tractors and Auto Patrols for winter maintenance in clearing state, county and township highways and keeping them in condition, may be secured by those interested direct from the Caterpillar Tractor Co., Peoria, Ill.

Resilient-Type Road Guard

368 The Resiliflex road guard which, according to the manufacturer, will withstand the full tractive force of one of the largest steam locomotives made and which has been in use since 1927, is fully described and illustrated in Bulletin 142 which may be secured direct from the National Traffic Guard Co., Atlanta, Ga.

Shovel and Crane Bulletin

369 The Universal Crane Division of the Thew Shovel Co., Lorain, Ohio, will be glad to send to interested contractors and engineers a new bulletin containing complete information on Lorain shovels, draglines, truck cranes and shovels, and the rest of its line of dirt-moving equipment.

Portable Roller Pamphlet

370 Literature describing and illustrating the Galion portable roller, which is easily transported from place to place at truck speed as the roll can be raised off the ground by means of a hydraulic lift and which is particularly adaptable for close-to-curb rolling, may be secured by those interested direct from the Galion Iron Works & Mfg. Co., Galion, Ohio.

Booklet on Cast Iron Pulleys

371 The Link-Belt Co., 300 West Pershing Road, Chicago, Ill., has issued recently an 8-page illustrated booklet, No. 1622, describing cast iron pulleys for power transmission, including data on solid and split, single and multiple-arm machine-molded pulleys, with and without rubber lagging, which it will be glad to send to those interested on request.

Asphalt for Road Building

372 Complete information on Texaco asphalt which has been in use for road building for a third of a century may be secured by interested contractors and engineers direct from the Texas Co., Asphalt Sales Dept., 135 E. 42nd St., New York City.

Complete Line of Snow Plows

373 The Good Roads line of Champion snow plows, in a variety of types and models, and the various attachments are fully described and illustrated in a new 68-page booklet, Catalog No. 102, which has just been issued by the Good Roads Machinery Corp., Kennett Square, Pa. Copies are available upon request.

New Catalog on ¾-Swing Shovel

374 Bulletin No. 1683, a new catalog describing and illustrating the features of the Austin-Western ¾-swing Badger shovel, has recently been published by the Austin-Western Road Machinery Co., 1815 Barrows St., Aurora, Ill., which will be glad to send copies on request.

New Bulletin on Tractor Equipment

375 The Bucyrus-Erie Co., So. Milwaukee, Wis., has issued recently a new bulletin on its tractor equipment line, describing in detail and illustrating the Bucyrus-Erie Bullgrader and bulldozer for T-20 TracTracTors, which is available to all interested.

Bearings for Hard Usage

376 Hyatt roller bearings which are designed for hard usage under the severe operating conditions to which construction equipment is subjected are made by the Hyatt Bearings Division, General Motors Corp., Newark, N. J., which will be glad to send full information on request.

Soil-Testing Instruments

377 Catalog 37S-CE, describing American soil-testing instruments which meet A. S.T.M. and U.S.B.P.R. standards, and Catalog 2052-CE on American earth exploration meters may be secured by interested contractors and engineers direct from the American Instrument Co., Inc., 8012 Georgia Ave., Silver Spring, Md.

Blade and V-Type Snow Plows

378 Warco blade and V-type snow plows for grader or truck mounting are described in literature which interested state, county and township engineers may secure direct from the W. A. Riddell Corp., Bucyrus, Ohio.

Lubricant for Diesels

379 Complete information on Sinclair Tenol, a new fused lubricant developed especially for Caterpillar diesels, as well as on Sinclair diesel fuel and other petroleum products may be secured direct from the Sinclair Refining Co., Inc., 630 Fifth Ave., New York City.

Vacuum-Control Shovel Feature

380 The metered vacuum control which is claimed to speed up digging by making every swing of the dipper fast and accurate as well as the other features of the Buckeye Clipper ½, ⅝ and ¾-yard shovels are described in literature which the Buckeye Traction Ditcher Co., Findlay, Ohio, will be glad to send on request.

Pile Hammers and Extractors

381 Literature describing McKiernan-Terry pile hammers and extractors, as well as hoists, derricks, whirlers and special movable bridge machinery may be secured direct from the McKiernan-Terry Corp., 19 Park Row, New York City.

New Scraper Bulletin

382 The features of construction of Le Tourneau Carryall scrapers, as well as their use with Caterpillar tractors for loading, hauling and spreading, is described in the new illustrated booklet recently issued by R. G. Le Tourneau, Inc., Peoria, Ill., and Stockton, Calif., which may be secured by those interested upon request.

Snow-Plow Blade for Motor Grader

383 Your Adams motor grader No. 20 can be made into a year-round outfit by adding the reversible-blade hydraulically operated snow plow that is described and illustrated in new literature which the J. D. Adams Co., Indianapolis, Ind., will be glad to send to those interested.

Manual on Use of Aluminum Paint

384 A booklet "Aluminum Paint Manual" has recently been issued by the Aluminum Company of America, Gulf Bldg., Pittsburgh, Pa., containing interesting information on the use of aluminum paint on various types of surfaces, general interior painting with aluminum paint and specifications for aluminum-paint vehicles. Copies of this helpful manual may be secured free by writing direct to the company.

Heavy-Duty Engines

385 Franklin Aircooled heavy-duty engines, designed especially to power the motor trucks, tractors, compressors and other heavy-duty equipment in the construction field, are described in literature which the Air Cooled Motors Corp., Syracuse, N. Y., will be glad to send on request.

Air-Operated Concrete Vibrators

386 Munsell air-operated vibrators for all classes of concrete construction, including bridge deck slabs, dams and locks, as well as the Munsell portable vibrating screed board for highway pavement, are described in circulars which may be secured direct from Munsell Concrete Vibrators, 997 West Side Ave., Jersey City, N. J.

Hydraulic Jacks

387 The Blackhawk Mfg. Co., Dept. CM-10, Milwaukee, Wis., will be glad to send to interested contractors complete information on its line of Blackhawk hydraulic jacks, in 1 to 75 tons capacity, for use on construction jobs.

Electric Power for Portable Tools

388 Literature describing Kato portable electric plants for furnishing electric power for portable electric tools, floodlights and similar uses may be secured direct from the Kato Engineering Co., Mankato, Minn.

New Concrete-Placing Unit

389 The new Rex 160 Pumpcrete, a completely portable concrete pump for small jobs such as walls, foundations, culverts, bridges, and similar work, is described in a new booklet "A Message for You" which may be secured direct from the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis.

Trailers for Heavy Equipment

390 An illustrated catalog describing Rogers heavy-duty trailers for moving heavy machinery may be secured by those interested direct from Rogers Bros. Corp., 108 Orchard St., Albion, Pa.

Power, Air and Light

391 LeRoi engines of 4 to 400-hp, LeRoi-Rix air compressors in all sizes and mountings, single or two-stage, portable or stationary, and LeRoi lighting plants, 1½ kw to 200 kw, ac or dc, are described in literature which may be secured from the LeRoi Co., Milwaukee, Wis.

Weatherproof Lubricants

392 Complete information on Dixon waterproof graphited grease for cables, gears, and other machinery exposed to weather and excessive dust is found in Booklet W-148, copies of which may be secured from the Joseph Dixon Crucible Co., Jersey City, N. Y.

Latest Snow Plow Catalog

393 Copies of the latest Baker snow plow catalog, describing and illustrating the complete line of Baker snow plows for truck or tractor mounting, may be secured by interested state, county and township highway engineers direct from the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

Line of Crushing Equipment

394 Telsmith jaw crushers for coarse crushing, double roll crushers for secondary crushing and pulsators for uniform screening are described in Bulletins W-34, L-34 and V-34 respectively, copies of which may be secured from the Smith Engineering Works, 4014 N. Holton St., Milwaukee, Wis.

Bucket Bulletins

395 Williams Champion buckets, a feature of which is the power-arm combination of lever and block and tackle to make even the toughest digging easy, are described in bulletins which the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio, will be glad to send on request.

Motor Trucks for Road Builders

396 Complete information on Hug Roadbuilder trucks and how they may solve your hauling problems may be secured from the Hug Co., 716 Cypress St., Highland, Ill.

A Line and Surface Level

397 Complete information on the Sand's-Stevens line and surface level, a feature of which is that it is so constructed that it can not be detached accidentally from the line, may be secured direct from the Sand's Level & Tool Co., 8631 Gratiot Ave., Detroit, Mich.

Oil Engines for Construction Equipment

398 Waukesha-Hesselman oil engines, in which the fuel is sprayed into the cylinder by a conventional diesel fuel pump and injection system and which have electric ignition, are described in Bulletin 1031 which the Waukesha Motor Co., Waukesha, Wis., will be glad to send on request.

Two New Tractors

399 Complete information on the two new TracTracTors, a Model TD-35 diesel unit similar to the larger TD-40, and the new Model T-35, a 6-cylinder spark-ignition type for operation on gasoline or distillate, may be secured direct from the International Harvester Co., Inc., Harvester Bldg., Chicago, Ill.

Lighting the Job at Night

400 Catalogs describing the V-G light and the V-G Handy light and lantern, for illuminating the job at night, may be secured by those interested direct from the National Carbide Corp., Lincoln Bldg., New York City.

Small Shovels for Contractors

401 Northwest Engineering Co., 1730 Steger Bldg., 28 East Jackson Blvd., Chicago, Ill., will be glad to send to interested contractors complete information on Northwest ⅜, ½, ⅝ and ¾-yard shovels, cranes and draglines, features of which are long life, smooth swing, easy control and smooth travel.

Facts on Wellpoint Systems

402 "Pointed Wellpoint Facts," a new catalog recently issued by the Griffin Wellpoint Corp., 725 E. 140th St., New York City, contains complete information on the Griffin wellpoint system as well as many job photographs of Griffin installations throughout the country. Copies may be secured direct from the manufacturer upon request.

Pneumatic Equipment for Road Builders

403 Ingersoll-Rand equipment for road builders, including I-R air compressors, wagon drills, Jackhamers, Jackbits and grinders, and pneumatic hand tools, is described in literature which may be secured direct from the Ingersoll-Rand Co., 11 Broadway, New York City.

A New ¾-Yard Excavator

404 The Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis., will be glad to send to those interested complete information on the new Koehring 303 excavator, a ¾-yard shovel and 1-yard dragline or crane, fully and quickly convertible, which is entirely new and ultra-modern in design.

New Concrete Mixer Catalog

405 A new catalog describing Jaeger 3½S to 56S concrete mixers, features of which are fast charging and discharging speeds, machined steel tracks and two-wheel mounting, may be secured direct from the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio.

Asphalts and Road Oils

406 Complete information on Socony asphalts for the various types of asphalt pavements, road oils, and asphalt joint fillers, for use in road construction and maintenance, may be secured from the Socony-Vacuum Oil Co., Inc., Standard Oil of New York Division, 26 Broadway, New York City.

Material-Handling Equipment

407 Portable, sectional and permanent conveyors designed to suit the various material-handling requirements of construction jobs are described in literature which the Portable Machinery Co., York, Pa., will be glad to send on request.

Complete Line of Mixers

408 The latest catalog describing the complete line of CMC concrete mixers in all sizes may be secured direct from the Construction Machinery Co., Waterloo, Iowa.

Gas, Air or Electric Vibrators

409 The Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill., will be glad to send on request literature describing the Mall concrete vibrators which are available with gas engine, air or electric power.

Complete Line of Wheelbarrows

410 Complete information on Sterling balanced wheelbarrows and concrete carts in various sizes and styles to meet the requirements of construction jobs may be secured from the Sterling Wheelbarrow Co., Milwaukee, Wis.

A New Motor Oil

411 Complete information on the new Texaco motor oil, refined by the Furfural process, for motor trucks may be secured from the Texas Co., 135 E. 42nd St., New York City.

Trailer-Roller Is Self-Propelled

412 Complete information on the Wheeled Roller Model 135, for all types of patching and miscellaneous work, which is transported to and from the job as a high-speed trailer and is self-propelled on the job, may be secured from the Wheeled Roller Corp., San Antonio, Texas.

Bulletins and Pamphlets

(Continued from preceding page)

Excavating Equipment Booklet

413 The Browning Crane & Shovel Co., 16226 Waterloo Rd., Cleveland, Ohio, will be glad to send to those interested its new booklet containing illustrations and complete information on the Browning K-2 ¾-yard machine which is quickly convertible from crane to shovel, dragline, or trench hoe without changes in machinery or levers other than the booms.

Mesh Reinforcing for Concrete

414 Complete information regarding Clinton electrically welded fabric, which is claimed to have been successfully and economically applied to practically every form of reinforced concrete construction, is contained in a new bulletin which the Wickwire Spencer Steel Co., 41 East 42nd St., New York City, will be glad to send to those interested.

Portable Arc Welders

415 Hobart simplified arc welders, with remote control available, for use on construction jobs are described in a free booklet which Hobart Bros., Box CE-107, Troy, Ohio, will be glad to send on request.

Water-Cooled Air Compressors

416 Gardner-Denver two-stage water-cooled air compressors for supplying compressed air on the job are described and illustrated in literature which the Gardner-Denver Co., Quincy, Ill., will be glad to send.

New Road Roller Catalog

417 A new descriptive catalog illustrating Huber road rollers for construction and maintenance may be secured by interested contractors, state and county highway departments from the Huber Mfg. Co., Marion, Ohio.

Pumps for Construction Jobs

418 Literature describing Sterling pumps, features of which are their simple, rugged construction and dependable action, may be secured by those interested direct from the Sterling Machinery Corp., 411-13 Southwest Blvd., Kansas City, Mo.

Heavy-Duty Dumping Units

419 The Heil Co., Milwaukee, Wis., will be glad to furnish to those interested complete information on Heil heavy-duty dump bodies which are equipped with hydraulic hoists.

Snow Plows with Hydraulic Control

420 A new 24-page illustrated booklet describing the new Frink V-type model snow plows for light, medium and heavy snows, a feature of which is the full power hydraulic control, may be secured by state, county and township highway engineers upon request from Carl H. Frink, Clayton, 1000 Islands, N. Y.

Wellpoint Systems

421 Literature describing the Complete wellpoint system and job estimates for your particular unwatering problems may be secured from the Complete Machinery & Equipment Co., Inc., Dept. C, 36-40 11th St., Long Island City, N. Y.

Catalog on Bucket Features

422 The features of the Owen clamshell bucket are described and illustrated in literature which the Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio, will be glad to send on request.

Road Rollers for Maintenance Work

423 Buffalo-Springfield Roller Co., Springfield, Ohio, will be glad to send to interested state, county and township highway engineers complete information on its many models of Buffalo-Springfield road rollers for use in maintaining highways.

Tarpaulins for Construction Jobs

424 Diamond Brand Canvas Products Co., 150 Greene St., New York City, will be glad to send to interested contractors complete information and prices on its Diamond Brand tarpaulins which are proofed against water, rot and mildew.

Shovels with All-Welded Booms

425 P & H Pacemaker shovels, a feature of which is the all-welded boom of alloy steel, reducing their weight and increasing yardages, are described in literature which the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., will be glad to send on request.

Snow-Fighting Units with Full Traction

426 The Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y., will be glad to send to those interested complete information on Walter Snow Fighters and tractor-trucks, the feature of which is their 100 per cent traction, due to the Walter four-point positive drive.

V-Belt with Concave Side

427 Complete information on the Gates V-belt which has a patented concave side, eliminating side bulge and wear and assuring constant power, may be secured from the Gates Rubber Co., Denver, Colo.

New 2 and 3-Inch Aluminum Pumps

428 Bulletin CEM-22, describing the new Marlow 2 and 3-inch aluminum pumps, features of which are automatic recirculation control, oil seal, light weight and 4-cycle engine with speed control and foot and rope starter, may be secured direct from Marlow Pumps, Ridgewood, N. J.

Equipment for Winter Work

429 Literature describing concrete mixer heaters, water heaters, salamanders, and thawing torches for use in winter construction may be secured from the Aeroil Burner Co., Inc., Park Ave. at 13th St., West New York, N. J.

Tractor Front-End Snow Plows

430 White tractor front-end snow plows are described and illustrated in circulars which interested state, county and township highway engineers may secure from the White Mfg. Co., Elkhart, Ind.

Calcium Chloride for Curing

431 Full data, including A.S.T.M. specifications and Bureau of Standards reports, on the use of calcium chloride for curing portland cement concrete may be secured by interested contractors and engineers without obligation from the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich.

Hard Facing Welding Rods

432 A number of important hard facing applications are described and illustrated in Bulletin No. 20, entitled "Amsco Hard Facing Welding Rods" recently issued by the American Manganese Steel Co., 389 E. 14th St., Chicago Heights, Ill. A copy of this instructive folder may be obtained direct from the manufacturer.

Electric Bitumen Heater

433 The Eastern Car & Construction Co., 10 E. 40th St., New York City, will be glad to send to all interested contractors and engineers its new Bulletin No. 101 describing the Easton-Clarmac electric bitumen heater and containing data from actual field tests made on a 3,000-gallon unit.

New Book on Electric Motors

434 A new 60-page book has been issued recently by the Louis Allis Co., Milwaukee, Wis., describing and illustrating the construction, features, and applications of practically every commercial-type electric motor, including engineering data on various types of special motor applications. This book may be secured direct from the Louis Allis Co. upon request.

Portable Washing Plants

435 A new bulletin WP-1 has been recently issued by the Iowa Manufacturing Co., Cedar Rapids, Iowa, describing and illustrating its line of crushing, screening and washing plants which they will be glad to send to those interested upon request.

Building Pipe Lines Faster

436 Copies of a new 14-page booklet on building pipe lines faster and more economically by the Lincoln Shield-Arc process of welding may be secured by those interested direct from the Lincoln Electric Co., Cleveland, Ohio. Ask for Bulletin No. 418.

Connectors for Timber Joints

437 Teco spike grid connectors for use in the bracing of timber bents and timber trestles for highways and railroads, as well as in pier and wharf construction, which are claimed to increase the efficiency of the assembly, are described in literature which may be secured direct from the Timber Engineering Co., 1337 Connecticut Ave., Washington, D.C.

Tarpaulins for Contractors

438 Complete information and prices on Never-Rip waterproof and mildew-proof tarpaulins for use on construction jobs may be secured by those interested direct from the Canvas Products Co., 546 W. Washington Blvd., Chicago, Ill.

Portable Asphalt Plants

439 F. D. Cummer & Son Co., 17th and Euclid Ave., Cleveland, Ohio, will be glad to send to those interested complete information on Cummer large-capacity portable asphalt plants with 1, 1½ and 2-ton mixers, for either hot or cold mix.

Buckets for Contractors

440 Blaw-Knox Dreadnaught buckets for all types of digging and rehandling are described in Bulletin No. 1561, copies of which may be secured direct from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa.

Lubricating Construction Equipment

441 The new lubrication manual "Alemite Controlled Lubrication," describing the complete Alemite system for lubricating construction equipment may be secured by interested contractors and engineers from the Alemite Division, Stewart-Warner Corp., Dept. K, 1850 Diversey Parkway, Chicago, Ill.

Tamping Roller for Earth Fills

442 The Parsons Co., Newton, Iowa, will be pleased to send to interested contractors and engineers complete information on the Parsons disc tamping roller for compacting fills, levees, earth dams, road bases and shoulders.

Steel Reinforcing Products

443 A new catalog containing complete details on Truscon's complete line of steel reinforcing products for concrete roads may be secured direct from the Truscon Steel Co., Youngstown, Ohio.

Grader and Snow Plow Bulletins

444 Rome High-Lift graders and snow plows for grader mounting, which are designed for year-round road maintenance service, are described in bulletins which may be secured by those interested direct from the Rome Grader & Machinery Corp., Rome, N.Y.

Concrete Form Clamps

445 Complete information on Williams form clamps for working pressures up to 800 pounds per square foot may be secured by those interested from the Williams Form Engineering Corp., 1244 Prospect Ave., S.E., Grand Rapids, Mich.

Winter Heating Units

446 Littleford winter heating units for use in cold weather construction, including water and concrete heaters, salamanders and oil burners, are described in literature which may be secured from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

All-Steel Jaw-Crushers

447 Gruendler Crusher & Pulverizer Co., 2917 No. Market St., St. Louis, Mo., will be pleased to send to those interested complete information on Gruendler roller-bearing all-steel jaw crushers to meet any rock or gravel crushing problems.

Cotton Products for Contractors

448 Complete information on Fulton tarpaulins, windbreaks and mats for concrete curing may be secured by those interested from the Fulton Bag & Cotton Mills, Atlanta, Ga.

Complete Line of Trailers

449 Complete information on Jahn trailers, in all types and any capacity to meet every heavy-duty requirement may be secured from the C. R. Jahn Co., Builders Bldg., Chicago, Ill.

Self-Priming Centrifugal Pumps

450 Full information on Novo self-priming centrifugal pumps in sizes to meet the various pumping requirements of construction jobs may be secured by those interested direct from the Novo Engine Co., 216 Porter St., Lansing, Mich.

High-Speed Tractors

451 Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee, Wis., will be glad to send to interested contractors and state and county highway engineers complete information on Allis-Chalmers controlled-ignition oil tractors which are claimed to speed up the job.

Power for Construction Equipment

452 Complete information on Hercules heavy-duty engines for powering construction equipment, in both gasoline and diesel types, may be secured by those interested direct from the Hercules Motors Corp., Canton, Ohio.

Complete Line of Buckets

453 The Hayward Co., 32-36 Dey St., New York City, will be glad to send to interested contractors complete information on its line of digging and material-handling buckets.

Wire Rope for Construction

454 The Bethlehem Steel Co., Bethlehem, Penna., which has recently taken over the Williamsport Wire Rope Co. and will from now on continue the manufacture of wire rope of the same styles and quality as Williamsport, will be glad to send complete information on its new line of Bethlehem wire rope and strand.

Tires for Construction Equipment

455 Complete information on the types of Goodrich Triple-Protected Silvertown tires for use with construction equipment may be secured by interested contractors and engineers from the B. F. Goodrich Co., Akron, Ohio.

Convertible Truck-Mounted Shovel

456 The Michigan convertible ⅝-yard truck shovel which is easily changed to clamshell, dragline or trench hoe, is described in Bulletin C, copies of which the Michigan Power Shovel Co., Benton Harbor, Mich., will be glad to send on request.

Hoists and Dump Bodies

457 Hercules hoists and dump bodies, a feature of which is the super-power center-lift, and which are designed for trucks of every capacity, are described in literature which may be secured from the Hercules Steel Products Co., Galion, Ohio.

Mechanical Mixer Timelock

458 Complete details on the Hetherington & Berner patented mechanical timelock which operates off the mixer shaft and can be installed on any asphalt plant may be secured from Hetherington & Berner, Inc., Indianapolis, Ind.

All-Steel Hand Hoists

459 Complete information on Beebe 2, 5 and 15-ton all-steel hand hoists with patented instant gear change and positive internal brake may be secured from Beebe Bros., 2724 Sixth Ave., So., Seattle, Wash.

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The Highways of the Atchafalaya Basin Are Water Ways. U. S. E. D. Engineers Use These Speedy Air Boats for Daily Inspections.

Typical Transportation for a Survey Party Working on the Levees for the Great Atchafalaya Floodway in Southern Louisiana. See Page 1.

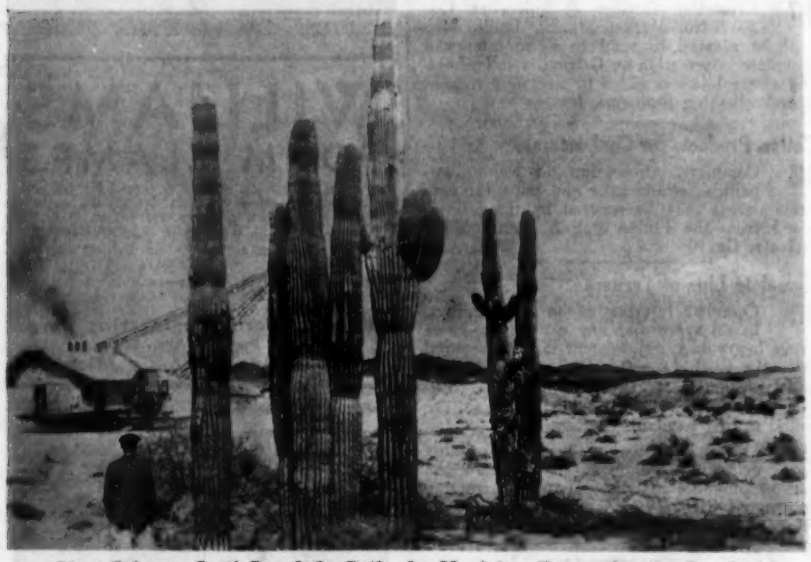
Spreading and Rolling Earth on Alum Fork Dam, 40 Miles West of Little Rock, Ark., Which Is Part of the New Water Supply Project for That City. See Page 2.

C. & E. M. Photos

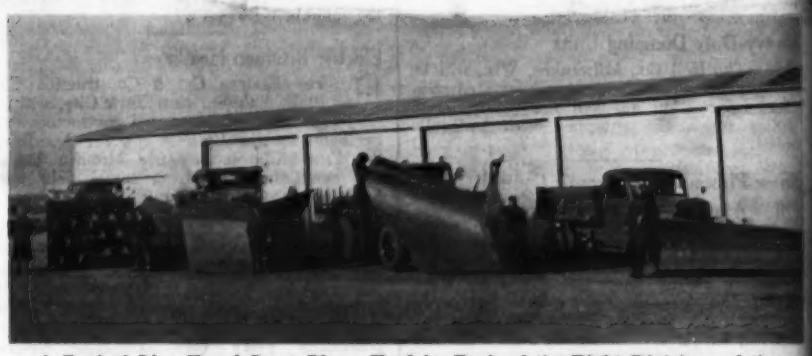
A Small Pumpcrete, Working 8 Hours Daily, Placed the Concrete for the Spillway at Alum Fork. Center, the Paver and Pumpcrete. Right, Discharging the Concrete.

Kaufmann-Fabry Photo

Photo Murals in the Modernistic District Office of the Division of Highways at Peoria, Ill. See Picks and Shovels on Page 1.



Giant Sahuaro Cacti Guard the Path of a Monighan Excavating the Canal of the Gila Valley Irrigation Project in Arizona. See Page 16.



A Typical Line-Up of Snow Plows Used by Each of the Eight Divisions of the North Dakota Department of State Highways. See Page 1.

A Truck Crane Takes to the Water. New York State Department of Public Works Mounts One of Its Eighteen Lorain 30's on a Flat Boat to Remove Clay Bank for Replacement with Riprap. This Machine Does General Excavation, Drives Piles, Unloads Barge Cargoes, and Serves as a "Handy Man" for the Department.

C. & E. M. Photos

Two Action Pictures Taken on the Walker & Michael 6-Mile Concrete Paving Contract North of Lexington, Tenn. Left, Feeding the Ribbon to the Center Joint and Finishing the Slot. Right, One of the Two Steel Bull-Floats Which Are Far Easier to Handle Than the Old Heavy Wooden Ones. See Page 12.